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Assessment of Hazardous Waste Mismanagement Damage Case Histories

Hart (Fred C.) Associates, Inc., New York

Prepared for

Environmental Protection Agency, Washington, DC

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Assessment of Hazardous Waste Mismanagement

Damage Case Histories

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This report summarizes existing data on damage histories associated with land and non-land based hazardous waste storage, treatment, and disposal facilities. The objectives were to develop estimates of potential damages due to hazardous waste mismanagement and to develop an extensive data base delineating the types of damages that could occur and the reasons for those damages.

While a total of 929 sites were selected for evaluation by this study, because very specific criteria were utilized in selecting these sites, they are not necessarily representative of all hazardous waste damage cases. However, the study has provided information that should be useful in gaining an understanding of :

--kinds of events that have resulted in contamination or damage at different facility types;
--kinds of chemicals commonly implicated at different facility types;
--kinds of remedial responses that have been initiated at a number of sites; and
--kinds of facilities and facility operations that have led to contamination and damage incidents in the past

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FOREWARD

This report has been developed under contract number 68-01-6474 to provide regulatory technical support to the Office of Solid Waste (OSW) in its effort to promulgate hazardous waste regulations under Subtitle C of the Resource Conservation and Recovery Act (RCRA). To this end, OSW identified the need to develop a data base on damage case histories associated with hazardous waste facilities.

It is particularly important for the reader, throughout this analysis, to be cognizant of the fact that the sites evaluated were selected based on very specific criteria and as such it would be difficult, at best, to attempt to draw conclusions about the universe of all damage cases based on the finding of this study.

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Executive Summary

Overview

The Hazardous and Industrial Waste Division of the Office of Solid Waste (OSW) is responsible for promulgating hazardous waste management regulations under the Resource Conservation and Recovery Act (RCRA). To this end, the OSW identified the need to develop an extensive data base on damage histories associated with land and non-land based hazardous waste disposal facilities. The intent of this effort was to secure available data bases to assist in developing estimates of potential damages due to hazardous waste mismanagement, to develop an extensive data base delineating the types of damages that could occur and for what reasons and thus to provide substantial additive information that would be of use in the regulatory impact process. To more precisely define the types of data most appropriate for inclusion in the data base, and to provide specific direction for the data gathering efforts, a five page survey form was developed, with additional pages appended for supporting documentation, as necessary. Under Phase I of this effort, these "Damage Incident Summary Forms" (DISFs) were completed for a total of 929 sites across the country. The data necessary to complete the survey forms was obtained via a detailed review of Field Investigation Team (FIT), Surveillance and Analysis (S&A) and regional EPA files.

It is particularly important for the reader, throughout this analysis, to be cognizant of the fact that the 929 sites evaluated were selected based on very specific criteria. These criteria included the preferential selection of active and inactive disposal sites for which laboratory sampling data was available, sites that were operated as storage facilities and sites that had been MITRE scored. (The interim list of 175 MITRE scored sites "rescored" in September-October 1981 by EPA.) The following sections outline in more detail the project history, the data system, and the review procedures utilized. As well, the Appendices provide a copy of the DISF, general instructions, and summaries of the DISF evaluations for each region.

It should also be noted that the data bases selected for use in this study, i.e., largely the FIT and S&A data bases, were constrained in a number of ways. These constraints included files that were in various stages of completion and in some cases files that were either unavailable or restricted due to legal considerations. Furthermore, the data base for any given site is inherently larger than that found at EPA files alone. State and local health agency files are typical examples of data bases that were excluded from this study but were very often more complete than corresponding EPA site files.

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In view of the file preselection process and the constraints associated with the data base used, it should be noted that these cases are not necessarily representative of all damage cases either on file at EPA or in existence in the field. As well, it would be difficult, at best, to attempt to draw conclusions about the universe of all damage cases based on the findings of this study.

Findings and Conclusions

As a result of the data base review, the site history reviews and the subsequent data analysis, the study team recorded the following summary conclusions:

- The FIT, S&A and regional EPA files contain the most readily accessible data bases on potential site damages of the data bases examined in this study.

- The information derived from these data bases is helpful in evaluating a variety of factors relevant to hazardous waste mismanagement cases. The study has provided information that should be useful in gaining an understanding of:

  - what kinds of events have resulted in contamination or damage at which facility types,

  - what kinds of chemicals are commonly implicated at which facility types,

  - what kinds of remedial responses have been initiated at a number of sites,

  - the current status of FIT and S&A files,

  - which kinds of facilities and facility operations have led to contamination and damage incidents in the past,

  - what kinds of environmental and public health monitoring has been employed to date, and

  - specific cases that are available for further detailed "cause and effect" analyses.

- While facility types, operating conditions and environmental setting of the sites evaluated varied on a case by case basis, a typical site profile emerges. The typical site was undesigned, with little information on file to suggest that adequate operating and maintenance procedures were routinely employed. Most sites contained no liners, leachate or runoff collection systems and/or containment facilities and inactive

(13)

sites almost invariably received inadequate closure. In addition, most of the sites evaluated were located in poor hydrogeologic/ environmental settings. For example, in the majority of cases, the facility was located in moderate to highly permeable soils, within 10 feet of groundwater, and 100 feet of a surface water body. In many cases, the facility was also located within one-half mile of shallow drinking water wells.

- Of the 929 sites evaluated, the facility types most commonly identified with potential contamination or damage included landfills, containers, tanks, and open dumps.

- 56 percent of the sites were identified as active facilities and 42 percent as inactive facilities. The remaining 2 percent could not be identified as active or inactive using the information available in the files.

- Most of the contamination originating from these sites was discovered between 1979 and 1981, a time period coinciding with the initiation of most state and federal hazardous waste management programs. For this reason, an accurate assessment of the time period during which site related contamination has been occuring could not be completed.

- The average number of operating years associated with these facilities was 7.6 years, a statistic based on a probability plot of the operating years of 354 facilites having this information on file. Two-thirds of the facilities had been operating between 1 and 38 years.

- Approximately 90 percent of the sites evaluated had evidence of suspected or documented contamination.

- Groundwater, surface water, and soil were the media for which data indicated contamination most often and at approximately the same percentage of sites.

- The events most often associated with contamination included leachate migration, leaks, spills, fire/ explosions, emission of toxic gas/mists, and erosion.

- The most commonly identified contaminants included metals, volatile halogenated organics and volatile non-halogenated organics.

- Damage was suspected or documented at 59 percent of the sites evaluated, or 63 percent of the sites involving contamination.

- Approximately 25 percent of the sites evaluated have documented evidence of damage to human health or the environment.

- Suspected damage was most often reported to drinking water, human health, fauna, and flora.

- Documented damage was most often reported to drinking water and property.

- The data bases utilized in this study have only limited information related to air emissions and potential public health damages associated with air emissions.

- While remedial programs varied on a case by case basis, various legal actions and/or remedial activities have been initiated at a significant number of the sites evaluated in this study. For example, legal or enforcement activities have occured at 19 percent of the sites, while 55 percent of the sites have had or are currently completing additional environmental investigations. At approximately 30 percent of the sites, remedial activities of some type have been initiated.

- The type of data available in the files examined in this effort, in conjunction with similar state level files, would appear to be the most suitable for the developement of follow-up studies of cause/effect damage case histories.

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1.0 Introduction

1.1 Background

The Hazardous and Industrial Waste Division of the Office of Solid Waste (OSW) is responsible for promulgating hazardous waste management regulations under the Resource Conservation and Recovery Act of 1976 (RCRA). Under RCRA authorities, the Part 264 regulations relating to general facility requirements were issued in interim final form in February, 1981 with the final promulgation scheduled for late 1982, as required by Federal Court Order. In addition to developing the necessary data base to support these regulations, OSW must also complete Regulatory Impact Analyses (RIAs), as required by Executive Order 12291, issued February 18, 1981. In order to achieve these objectives, EPA identified the need to develop and compile damage case histories associated with mismanaged land and non-land based hazardous waste disposal facilities. The information to be compiled under Phase I of this project will serve to provide a compilation of damage information on a large number of active and inactive disposal sites meeting certain selection criteria, will provide information of the kinds of environmental damages associated with certain contamination events and will, as well, provide some measure of the overall extent of contamination and damage resulting from the mismanagement of hazardous wastes. Furthermore, the data will be useful in evaluating potential regulating alternatives, and in assessing the needs for further data gathering efforts.

1.2 Task Goals

The overall purpose of the task is to provide technical support to EPA in resolving the technical issues arising from the promulgation and implementation of the hazardous waste disposal regulations. In that regard, EPA identified the need to develop a data base on environmental and public health damages attributed to incidents of hazardous waste mismanagement. This data base can then be used to analyze damage incidents by facility type and to assist the Agency in preparing regulations more specifically tailored to individual facility types. The data base can also be used for a number of other purposes including, for example, assistance with the development of the on-going RIA process.

1.3 Overall Project Approach

This overall task entailed two separate efforts, Phases I and II. Phase I included the initial review of approximately 1,000 Field Investigation Team (FIT), EPA Surveillance and Analysis (S&A), and regional files in each of the ten EPA Regions. Damage Incident Summary Forms (DISFs) were completed for these and other documented damage cases on file. These included open dumps, spill sites, landfills, surface impoundments, land treament facilities, incinerators, storage/treatment facilities (containers, tanks, piles), injection wells, boilers using waste as fuel, and recycling/reclamation facilities. For each site containing one or more facility type a DISF was completed. The completed DISFs identified each site by name, location, and facility type, and media exposed to contamination (ground water, surface water, soil, or air), the extent and severity of damage, the event(s) and waste causing the incident, the status of remedial activities and information sources used. This report entitled "Assessment of Hazardous Waste Mismanagement Damage Case Histories" (the Report), completes Phase I.

Specific tasks undertaken in the first phase of this effort to accomplish the overall project objectives also included:

- Identification, review, and assessment of existing potential sources of information. The sources included the Site Tracking System (STS) files; EPA regional, FIT, and S&A files; state files; etc. Identification of the information sources utilized in this analysis is presented in Section 2.1 of this report.
- Development of site selection criteria to best meet the technical information requirements of EPA and to most efficiently utilize the available data base are described in Section 3.1.1, including preferential selection of:
    - sites having available sampling data,
    - site identified as storage facilities, and
    - MITRE scored sites. (The interim list of 175 MITRE scored sites " rescored " in September-October 1981 by EPA.)
- Development of review criteria to insure uniformity of DISF responses regarding the identification of contamination and damage events, rating of damage severity and determination of the level of file documentation required to support given responses. (A completed sample DISF has been included in Section 3.1.3. Specific evaluation criteria used in determining appropriate DISF responses are discussed in detail in Section 3.1.4 of this report).
- Completion of 929 DISFs for use by OSW and other agencies and the preparation of a report that summarizes the types of facilities studied in each region, the contamination and damage incidents associated with those facilities, the potential causes of contamination and damage incidents, the indicated severity of the damages, and the status of enforcement and remedial actions.
- Selection of damage incident cases for in-depth Phase II damage cause and effect analyses. Site selection criteria

for this phase included.

- availability of substantial additional amounts of information (largely at the state file level),
- documented damage, as contrasted to suspected damage, and
- engineered facilities as opposed to undesired facility types such as open dumps or spill incidents.

Subsequent to EPA review and approval of the Report, and to ongoing regulatory support requirements, Phase II will be implemented. Phase II of this work effort requires the study team to conduct an in-depth damage investigation of a number of the sites that were reviewed in the first phase. The in-depth study will correlate reported damages with actual causes including facility design, physical setting, waste type and facility age.

2.0 Project History

2.1 Sources of Information

The initial task of the study team was to identify potential sources of damage case data. In October 1981, the study team conducted a computer search, reviewed reports and interviewed representatives from a variety of government agencies (including EPA), health organizations, environmental advocacy groups, environmental firms, insurance firms, computer firms and interested professional associations. As a result of this effort, the study team developed an initial appreciation of the relative value of the various data bases. Table 2-1 describes the study team's assessment of the potential utility of available data sources. This task essentially confirmed that EPA and its supporting government contractors had the most comprehensive collection of damage case histories available for review.

As noted, files considered for supplementing the existing EPA data base included data bases from other federal sources (i.e. the Center for Disease Control, Department of Defense), from the states, and from private industry, particularly insurance companies. However, the reasons for focusing on EPA and EPA contractor data bases rather than on other data bases included:

- breadth of coverage of the EPA-related files, because other files had necessarily smaller populations for review, and

- accessibility of EPA-related files and supporting information.

2.2 Work Plan Development

Given budget and time constraints, it was not feasible to complete a detailed investigation of all the available data bases listed in Table 2-1. For the reasons noted, the OSW therefore directed the study team to concentrate its efforts on data bases from which the most detailed and readily accessible information was available. A work plan for developing damage case histories was submitted to the EPA for review in November 1981. This plan included the following items:

1. completion of a detailed computer and literature search of nationwide damage cases utilizing the DIALOG system (a computerized data retrieval system that accesses approximately 150 technical data bases),

2. obtaining computer access to the STS to identify all potential sites,

3. review of the applicability of data contained in FIT files in Regions II and VIII,

4. review of headquarters FIT files for data applicability in Regions I, III, IV, V, VI, VII, IX and X,

5. contact with national and state health and solid waste agencies for epidemiological studies relating to hazardous waste mismanagement,

Table 2-1

SUMMARY OF AVAILABLE SOURCES EVALUATED

Source	Utility for Selecting Detailed Case Histories	Estimating Percent of Problem Sites by Facility Type	Availability of Detailed Damage Case Histories
NOTIS(1)	Med.	Low	Low
HWDMS(2)	Low	Low	Low
STS(3)	Med.	Med.	Low
SIIS (SIA)(4)	Med.	High	Low
OGC(5)	High	Low	High
CDC(6)	Med.	Low	Med.
DOD(7)	Med.	Low	Med.
Insurance Co.	Med.	Low	Low
E&E(8) HQ	Med.	Low	Low
Regional FIT	High	Low	High
Regional EPA	High	Low	High
State	High	Low	High
Eckhart(9)	Low	Low	Low

Notes:

(1) NOTIS - Superfund Notification Systems
(2) HWDMS - Hazardous Waste Data Management System
(3) STS - Site Tracking System, EPA files.

(4) SIIS (SIA) - Surface Impoundment Information System (Surface Impoundment Assessment), EPA Files.

(5) OGC - Office of General Counsel
(6) CDC - Center for Disease Control
(7) DOD - Department of Defense
(8) E&E - Ecology & Environment (EPA FIT Contractor)

(9) Eckhart Report - House Subcommittee on Oversight and Investigation

6. preparation of a complete DISF for each site reviewed,
7. completion of report summarizing the results of the above items, 1 through 6, and
8. coordination of the above activities with EPA personnel, as required.

The work plan was subsequently revised to expand item 3 to include an evaluation of FIT and S&A files at each of the ten EPA regions. This decision was based on the fact that primary sources identified in the work plan, i.e., the STS system and EPA headquarters files, did not contain the detailed information required for the site DISFs. The EPA file reviews also included, where possible, RCRA permit and EPA regional Superfund related files. The actual criteria used by the study team for identifying sites to be reviewed for this analysis are outlined in Section 3.1.

2.3 Project Chronology

This first phase of Contract 68-01-6474 was initiated on October 14, 1981. Throughout the remainder of October and November the work plan was revised. A revised work plan was ultimately approved on December 4, 1981. The review of Region II FIT data began in early November and continued through December. Also in December the draft report outline, sample DISF and DISF instructions were submitted and a summary of Region II data was prepared. In January the visits to the nine remaining Regions were conducted, the Region II S&A files were reviewed and the state survey for epidemiological data was conducted. Based on the regional visits a revised work plan was submitted. On January 29, 1982 EPA issued a stop work order on this project.

Work on the project was resumed on March 15 and a summary of accessible files was prepared. The completed DISFs for Regions I and V were forwarded to EPA in April, the criteria memo on Phase II sites was distributed and report preparation was underway. In May the remaining DISFs were forwarded as were the Region I, II, III, V and IX reject site files and tables summarizing each Region (Table A). On May 7 the first draft report was submitted to EPA. The EPA comments on the draft were received by FCHA on July 30. These comments were incorporated and a revised draft report was submitted in September 1982. Final comments were received by FCHA on November 1982 and are included in this document.

3.0 File Review Procedures

3.1 Evaluation Process

3.1.1 Case Selection Criteria. Table 3-1 summarizes the six criteria developed to select damage case histories contained in FIT, S&A and regional files. Files conforming with these criteria were identified as the most suitable information sources from the standpoint of the project goals.

Criteria 1 and 4 identify files associated with sites for which sampling and analytical data were available. These files generally were those sites inspected, investigated and sampled by FIT and/or S&A teams. FIT files for which sampling data were not available usually were not sufficiently detailed to support damage case assessments. These files typically contained only preliminary assessment reports, which, in many cases, recommended that follow-up sampling programs not be initiated because there was little or no contamination identified at the sites. In other cases, results of recommended sampling programs were not on file, since projects were still in progress during the study period. Also, many of the S&A files that lacked sampling data were found to be unsuitable for the project for other reasons such as they typically consisted only of RCRA inspection reports or related environmental permits.

Criteria 2 and 5 identified files associated with storage facilities, such as tanks and containers, as defined in 40 CFR 260.10 (Reference, Appendix A, Definitions, DISF Reference Number 11). Criteria 5 was further refined to include only those sites for which there was evidence of damage in order to develop a suitable data base consistent with project goals. This eliminated from analysis a large number of files associated with wastewater treatment plants and treatment, storage or disposal (TSD) facilities that had experienced minor National Pollutant Discharge Elimination System (NPDES) or RCRA Interim Status Standard (ISS) permit violations that had not resulted in adverse environmental impacts.

Criteria 3 and 6 targeted sites identified under the Superfund program as the 175 highest MITRE scored sites. These MITRE scored sites were "rescored" in September-October 1981 under the direction of EPA. These sites were included in the survey on the assumption that environmental damage could potentially be documented at these locations. The MITRE Model itself is a rating format used to identify sites having a high potential for causing health and environmental damages. Factors evaluated include hydrogeological setting, quantity and type of deposited wastes and proximity of residential areas and drinking water supplies. This model was completed in 1980 and has been used to rate and prioritize hazardous wastes sites under the Superfund program.

3.1.2 Evaluation Procedures. Files in each region were evaluated by a study team consisting of a project director, team leader and four to five technical assistants. Guidelines, definitions and criteria used by the study team in making the interpretations and judgements needed to complete the DISFs are discussed in Section 3.1.3 and 3.1.4. It is particularly important for the reader, throughout this analysis, to be cognizant of the definitions and interpretations outlined in Appendix A.

Table 3-1

SUMMARY OF CASE SELECTION CRITERIA FOR EVALUATED SITES FOR FIT AND S&A FILES

EPA Field Investigation Team (FIT) Files

Criteria Number	1	2	3
Criteria Description	Files having sampling data	Files associated with storage facilities	Files associated with MITRE scored sites(1)

EPA Survey and Analysis (S&A) Files

Criteria Number	4	5	6
Criteria Description	Files having sampling data	Files associated with storage facilities for which there is evidence of damage	Files associated with MITRE scored sites(1)

Note: (1) The interim list of 175 MITRE scored sites "rescored" in September-October 1981 under the direction of EPA.

In summary, the evaluation procedure consisted of a two-phase effort. The first phase consisted of visiting regional FIT and S&A offices, screening files according to the selection criteria (Table 3-1) and transferring the appropriate information to the DISFs. This effort was accomplished over a noncontinuous nine-week period beginning in November, 1981, and ending February, 1982. The second phase consisted of reviewing the completed DISFs for consistency, format and editorial standards, tabulating the conformed DISFs and summarizing the information in the report. This effort was accomplished over a period of several weeks beginning in late March, 1982 and ending with the submission of the report.

3.1.3 Evaluation Format. The DISF was used to assess damage case histories and associated site characteristics. After the study team reviewed the file information, appropriate responses were made on the DISF (Sections I through XII) and the case was summarized in a brief narrative (Section XIII), which was attached to the DISF form. Sections I through XIII of the DISF are listed below:

I. Site Identification
II. Site Description
III. Date of Incident/Discovery
IV. Status of Operations
V. Exposed Media
VI. Affected Areas
VII. Epidemiological Studies
VIII. Event Causing Incident
IX. Waste Characterization
X. Status of Response
XI. Source of Information
XII. Severity of Damage
XIII. General Comments

Each section was organized into subsections and subheadings, and each subheading identified by notes, numbered 1 through 24. These numbers refer to instructions and/or definitions. These definitions and the first twelve sections of the DISF are included in Appendix A of this report. A completed DISF taken from one of the sites evaluated in Region I has been included as a sample in Figure 3-1.

3.1.4 Evaluation Criteria. DISF responses for Sections I, II, III, IV, VII, and X were prepared from information available in the files according to the definitions and instructions contained in Appendix A. DISF responses for Sections V, VI, VIII and IX required value judgments based on the pre-selected evaluation criteria as summarized in the following subsections. For example, the study team was frequently required to assess whether contamination had occurred, the media exposed (Section V), the event causing the incident (Section VIII) and the waste causing contamination (Section IX). Depending on information available in the file, responses in this section were determined by the reviewer to be either documented or suspected. Finally, the study team was required to assess the severity of damage which had occurred to either human health and/or the environment (Section XII). In order to ensure that the study team rated sites uniformly, evaluation criteria were developed for use as guidance in:

- identifying contamination and damage events,
- rating the severity of damage, and
- determining the file documentation required to support a given response (i.e., documented versus suspected).

FIGURE 3 -1

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES (1)
COMPLETED DISF

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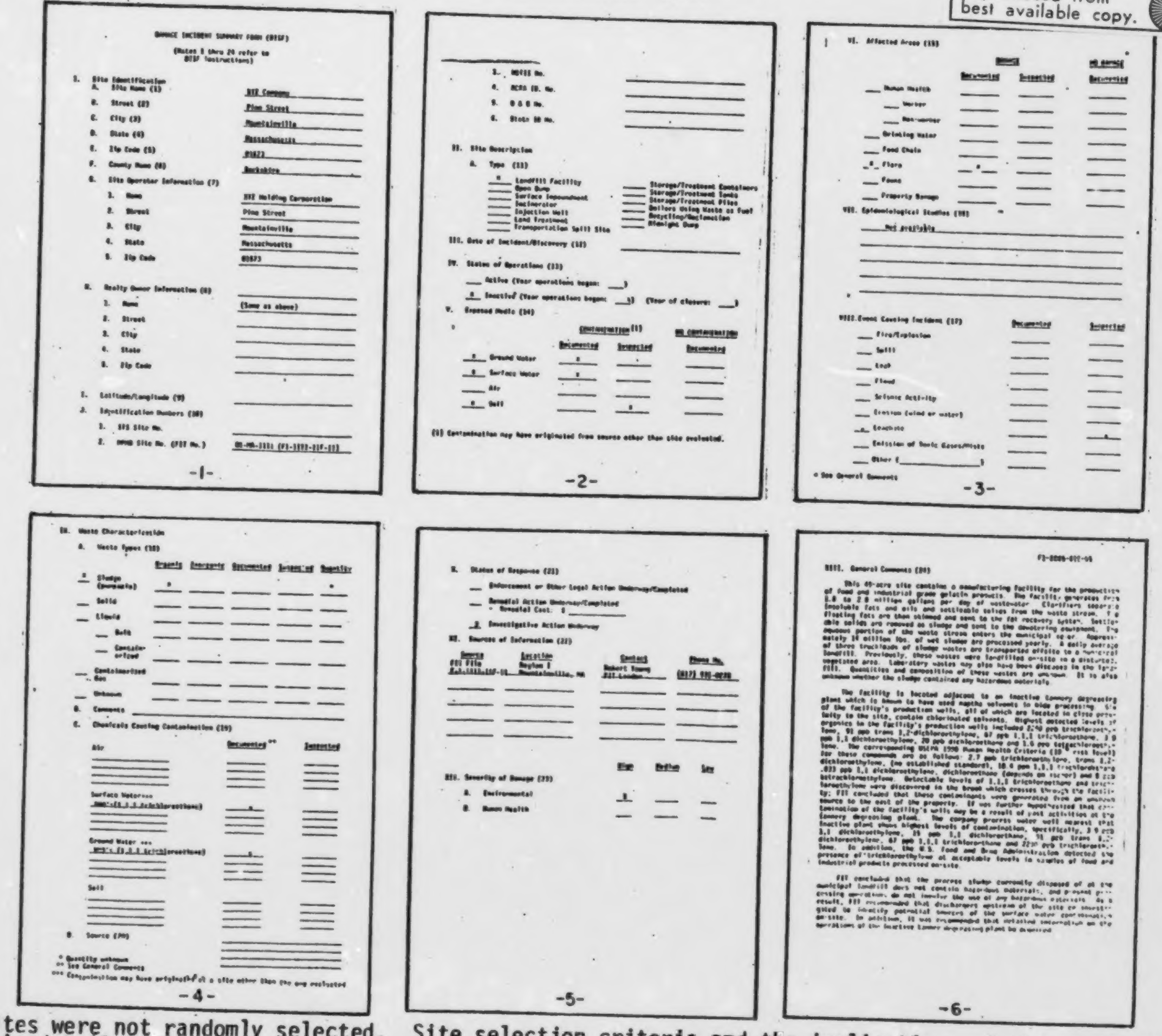

(28)

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of this criteria are discussed in detail in Sections 3.1.1 and 3.2.1

3.1.4.1 Identifying Contamination and Damage. In this study, "Contamination" is defined as the presence of pollutants in groundwater, surface water, soil or air, identified as present using standard sampling and analytical techniques. "Pollutants" are defined as substances not naturally found in the site-specific environment that may interfere with the best use of, or cause environmental harm to, the affected resource. "Identified" is defined as positive contaminant verification at concentrations above the detection limits of the sampling and analytical techniques applied. Verifiable concentration levels varied, but in most cases were in the part per billion (ppb) range. "Standard sampling and analytical techniques" are identified elsewhere in the report (Reference, Appendix A, Definitions, DISF Reference Number 14).

Contamination was considered to be documented if the event was substantiated by a direct investigative action, regulatory office or other recognized agency.(1) File information required to support documentation included:

- sampling data,
- excerpts from relevant documents (engineering reports, environmental impact statements, NPDES and RCRA permits, enforcement actions, etc., and
- professional evaluations, expert witness testimony, etc.

"Damage" was defined as the presence of pollutants at concentrations causing interference with, loss in quality of or harm to human health, drinking water, the food chain, flora, fauna or property. The study team differentiated between documented and suspected damage in the responses in Section VI (Affected Areas) of the DISF. Damage was considered to be documented according to the same evaluation criteria discussed previously, with certain additional criteria:

- DISF reponses indicating documented damage to human health were to be based on authoritative references in the file correlating sickness, injury or death with contamination events occurring at the site. These references would typically include hospital reports, OSHA citations, regulatory agency reports, facility operating reports and, in certain limited cases, epidemiological data.

- DISF responses indicating documented damage to drinking water were to be based on authoritative references in the file correlating excessive contaminant concentration levels in the water supply with contamination events occurring at the site. Excessive contaminant concentration levels were defined as constituent concentrations exceeding EPA National Interim Primary or Secondary Drinking Water Standards or EPA Human Health Criteria(1) for Maximum Contaminant Levels (MCLs) in water supplies. Where applicable, the study team used MCLs associated with incremental lifetime cancer risks estimated at one in one million (10^{-6}).

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(1) Note: In some instances file information suggested that contaminants may have originated off-site. These contamination responses were annotated in the DISFs and tabulated separately. These sites are discussed in the regional summaries (Reference Appendix B).

29

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- DISF responses indicating damage to food chain and flora were to be based on authoritative references correlating visible vegetation stress with contamination events occurring at the site.
- DISF responses indicating documented damage to fauna were to be based on authoritative references, usually bioassay studies, correlating fish and wildlife damage with contamination events occurring at the site.
- DISF responses indicating documented property damage were to be based on authoritative references correlating property damage with contamination events occurring at the site. These references would typically include insurance claims, regulatory reports, OSHA citations and enforcement actions restricting residential property, drinking water well or other site/facility usages.

Damage was considered to be suspected if responses to Section VI were based on citizen allegations, newspaper reports or inconclusive scientific studies.

3.1.4.2 Severity of Damage. The study team rated each site according to the severity of human health and environmental damage. Table 3-2 outlines broad guidelines developed by the study team to rate severity of damage. As noted in this table, high human health damage ratings were assigned to sites where incidents resulted in deaths, whereas low damage ratings were associated with minor, short-term injuries. High environmental damage ratings were typically associated with sites correlated with substantial fish or animal kills, and/or groundwater contamination incidents in which contaminant concentrations exceeded ten times the drinking water criteria discussed previously, (Reference, Section 3.1.4.1.) Low environmental damage ratings were usually associated with sites where soil or vegetation contamination were limited to relatively restricted areas.

Of note were the large number of sites evaluated for which file information was not yet complete at the time of the study. File information associated with many of these sites suggested that the severity of damage may be substantially greater than the response indicated by the study team. In these cases the evaluator noted the response with an asterisk (*) and tabulated these sites separately. These sites are discussed in the respective regional summaries (Reference, Appendix B.)

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(1) Federal Register Volume 45, #231,-November 28, 1980.

(30) 30

Table 3-2

SUMMARY OF GUIDELINES USED IN RATING SEVERITY OF DAMAGE AT EVALUATED SITES

Category	Severity		
	High	Medium	Low
Human Health			
	Damage incident to at least one person resulting in ...		
	... death	... severe injury	... minor injury.
		Contamination of groundwater resulting in closure or restriction of drinking water in a ...	
		... community water supply.	... single private well.
Environmental			
groundwater, surface water & air	Contamination incident where sampling indicates the presence of pollutants in concentrations ...		
	... at levels greater than 10 times applicable standards.	... at levels equal to applicable standards.	... at detectable levels, but less than applicable standards.
food chain, flora	Contamination incident resulting in stress to vegetated or food crop area ...		
	... greater than one acre.	... greater than 1/2 acre	... in limited areas only.
fauna	Damage incident confirmed by ...		
	... massive kills	... limited kills	... bioassay studies confirming tissue contamination.
soil	(1)	(1)	... Contamination incident confirmed by sampling data.

Note: (1) Higher levels of damage were typically identified via use of evidence in the other categories.

3.2 Implications of the Evaluation Process

3.2.1 Limitations of the Data Bases. A number of limitations are inherent in the data bases utilized for this analysis, in the selection criteria utilized to select sites for consideration and in the evaluations completed for this report. More specifically, the data base selected for use, i.e., largely the FIT and S&A data bases, are constrained in a number of ways. These constraints could include, for example:

- The files reviewed by the various project teams were in varying stages of completion. Depending on when the site was discovered and how critical the site was considered the progress of the investigation and work efforts at various sites varied significantly. Investigative efforts, for example, were underway in approximately 55 percent of the sites evaluated. As a consequence, information obtained and noted in the DISF forms, reflected conditions current as of the file review date.
- The entire files for individual sites were not always available. While in a limited number of cases enforcement or confidentiality issues limited access to particular files, in a large number of cases individual files were currently being worked with and the file materials themselves were often scattered among various staff members. While project team members attempted to gather all pertinent information, no realistic approach existed to actually ascertain if all available data was reviewed on a site-by-site basis.
- The data base for each site is inherently larger than that found at EPA above. Since a number of entities were often actively involved at individual sites there were a substantial number of occasions for which site data that would have been of use was most likely available but was not in EPA files.
- The data base is inherently incomplete. Area budget and time constraints, the typical data required to complete the DISF forms (i.e., analytical data, data quantifying environmental or public health impacts, etc.) was very often not available or very limited in actual scope.

In addition, the selection criteria utilized to identify individual cases tend to limit the applicability of the findings of this study to other populations of hazardous waste facilities. For example, for the FIT and S&A data bases, priority was given to sites for which analytical data was available. Given the costs of samples and analytical work, it is suggested that those sites for which analytical data has been collected most likely represent those sites originally perceived as higher priority sites. Furthermore, MITRE scored sites were preferentially selected, again reflecting a data base skewed towards the more serious of the sites exhibiting potential contamination or damage. The above two criteria were utilized since OSW was

(32) 32

specifically interested in reviewing as many cases as possible for which damage might have occurred.

For storage facilities, specific selection criteria were in place. All FIT storage sites were investigated for example, whereas only a storage site for which there was evidence of damage were preferentially selected from the regional S&A files. This criteria was utilized to specifically maximize EPA's data base on storage facilities.

As a consequence, it is difficult to apply the findings of this analysis to any other data base on hazardous waste facilities, abandoned sites, etc. As noted, the data base itself tends to conservatively estimate potential contamination and damages at hazardous waste sites due to the limited available data in the sites. On the other hand, the selection criteria generally tended to preferentially select the "higher priority" sites from that existing data base.

3.2.2 Other Uses for the Data Base. In supporting the regulatory impact analysis a substantial data base has been developed on 929 sites nationwide. This data is useful, not only for the purposes for which it was originally collected, but also for:

- Understanding more precisely which kinds of events have resulted in contamination or damage at what facility type.
- Understanding which kinds of chemicals are commonly implicated at what facility type.
- Understanding what kinds of remedial responses have been initiated at a number of sites.
- Understanding the current status of the FIT and S&A data files.
- Understanding what kind of facilities and facility operations have led to contamination and damage incidents in the past.
- Understanding what kind of environmental and public health monitoring has been employed to date and the sites investigated.
- Selecting specific cases for further detailed "cause and effect" studies.
- Assisting in developing and evaluating alternative regulatory strategies designed to reduce environmental and public health risks at least cost.

4.0 Facility Types

4.1 General

Prior to providing a detailed overview of the report findings, a brief discussion of the types of facilities analyzed in this report is provided. As noted, using the case selection criteria, the study team was able to evaluate a large number of sites. Although these sites varied significantly by facility type, operating condition and environmental setting on a case by case basis, facility profiles can be developed. A discussion of the various facility types (landfills, surface impoundments and storage/treatment facilities, containers, tanks and piles) is provided in subsections 4.2 through 4.6 respectively. These facility types represented 75 percent of the facility types evaluated. The remaining 25 percent of the facilities were described by various other categories. (A brief discussion of all facility types is also provided in Appendix A.)

4.2 Landfills

The landfills evaluated in this study typically varied in sizes ranging from 5 to 400 acres in surface area and generally contained significant quantities of liquids, pumpable sludges and/or drummed wastes. Approximately, 40 percent of the facilities evaluated could be described as primarily municipal landfill sites, 30 percent as primarily industrial waste landfill sites, and the remaining fraction as sites containing multiple facility types with a small landfill serving a specific industrial plant or complex. Landfills evaluated in this study were usually constructed without a bottom liner or leachate collection system. In the majority of cases for which information was available, the facility was located in moderate to highly permeable soils within 20 feet of groundwater and within 100 feet of a surface water body. In other cases (approximately 30 percent) the facility was located within one-half mile of shallow drinking water wells and was frequently located on sites contiguous to residential properties.

The facilities were typically constructed with poor or nonexistent surface drainage control facilities and there was little information on file suggesting that adequate operation and maintenance procedures were routinely employed. Most inactive landfills were not given adequate closure, although in the majority of cases wastes were covered periodically with fill material.

As will be noted in Section 5, 605 events causing contamination were tabulated for this facility type. Since most landfills were installed without adequate collection systems, leachate from deposited wastes accounted for the majority of the events tabulated for this facility type and leakage from drummed wastes within the landfill were also frequently occurring events.

4.3 Surface Impoundments

The surface impoundments evaluated in this study typically ranged in size from 1,500 square feet to 8.5 acres in surface area, and in depths ranging from 10 to 25 feet, and were generally found on sites containing other facility types. The typical surface impoundment was designed as either a percolation/evaporation pond or as holding/treatment facility and was almost invariably constructed without a bottom liner. In the majority of cases for which information was available the facility was located in moderate to highly permeable soils within 20 feet of groundwater and 100 feet of a surface water body. In many cases (approximately 90 percent), the facility was located within one-half mile of shallow drinking water wells and was frequently located on sites contiguous to residential properties.

The facilities were often constructed with insufficient free board and there was little information on file suggesting that adequate operation and maintenance procedures were routinely employed. Most inactive surface impoundments were not given adequate closure. In most cases wastes remained in the impoundment, either uncovered or covered with small quantities of sandy fill material.

As noted in Section 5.5.2, 500 events causing contamination were tabulated for this facility type. Since most surface impoundments were installed without bottom liners, leachate from deposited sludges and leakage of waste liquids accounted for the majority of the events tabulated for this facility type. Poor operating procedures and improper handling of wastes resulting in spillage and erosion of berms leading to leakage were also frequently occurring events.

4.4 Containers

The container facilities evaluated in this study held anywhere between 50 and 35,000 55-gallon drums on sites containing multiple facility types that ranged in size from 5 to 50 acres. Drummed wastes usually consisted of solvents, petroleum byproducts, pesticides or phenolic compounds. Since the average age of drums identified ranged from 5-20 years, drum conditions were usually considered poor, with visible leakage frequently reported in the files. Over one-third of the container facilities evaluated could be described as designated storage areas serving a specific facility, one-third as drums buried in landfills, and the remaining fraction as drums discarded in open pits, lagoons or dump sites. Container sites evaluated in this study were usually constructed on bare soil without concrete surface pads, bottom liners or containment structures. In the majority of cases, the facility was located in moderate to highly permeable soils within 20 feet of groundwater and 100 feet of a surface water body. In several cases (approximately 50 percent), the facility was known to be located within one-half mile of shallow drinking water wells, but was infrequently located on sites contiguous to residential properties.

The facilities were typically constructed with poor or nonexistent surface drainage control facilities and there was ample information on file suggesting that "poor housekeeping" procedures were routinely employed at these sites. Drums were rarely labeled or segregated. In at least one-third of these sites evaluated, fire or explosive conditions were identified. Most inactive sites containing drums were not given adequate closure.

Most container facilities consisted of sites with drums in poor condition, where adequate surface runoff or spill control measures were seldom employed and poor housekeeping was the rule, and where leaks and spills accounted for the majority of the events tabulated for this facility type. Since drums were buried in land disposal facilities without adequate closure or collection systems, leachate from drummed wastes, fires, explosions, or emission of toxic gases/mists were also frequently occurring events.

4.5 Tanks

The tank facilities evaluated in this study had capacities ranging from 500 to 200,000 gallons on sites typically containing multiple tanks as well as other facility types. Contamination was also frequently associated with other on-site facility types, rather than the tanks themselves. Approximately 70 percent of the tanks recorded in this study were aboveground facilities, typically containing petroleum byproducts, solvents and/or dilute acid/caustic solutions. Approximately 45 percent of the facilities evaluated could be described as manufacturing and chemical processing plants, 45 percent as chemical waste storage facilities, and the remaining 10 percent as aqueous waste treatment facilities. Underground facilities evaluated in this study were presumably constructed without liners or protective coatings. Aboveground facilities were occasionally constructed within bermed areas, however the berms and dikes frequently failed. In the majority of cases, the facility was located in moderate to highly permeable soils within 20 feet of groundwater, 100 feet of a surface water body and in cases involving aqueous waste treatment tanks, were typically located contiguous to and discharged into surface water bodies. In other cases (approximately 50 percent), the facility was located within one-half mile of shallow drinking water wells, but was infrequently located on sites contiguous to residential properties.

Although tanks were usually constructed with poor or nonexistent surface drainage control systems, information on file suggested that most tankage was operated and maintained at more frequent intervals and with greater care when compared to other facility types. However, there were frequent references to mechanical failures (specifically defective valves), poorly monitored wastewater discharges and accompanying NPDES permit violations, deficiencies in structural materials and inadequate containment facilities. Most inactive disposal sites containing tanks were not given adequate closure. In a few cases abandoned facilities were filled in.

Most of the tankage evaluated consisted of aboveground facilities without sufficient containment where spills and leaks accounted for the majority of the events tabulated for this facility type.

4.6 Piles

The typical piles evaluated in this study varied in sizes ranging from 200 to 800 cubic yards and were found on sites containing other facility types in almost every case. At the sites containing piles, other facility types were usually identified as the primary source of contamination. Approximately three-quarters of the piles evaluated could be described under one of the following categories:

- waste treatment/chemical processing sludges,
- mine tailings/metal slags and deposits, or
- battery casing piles.

Piles evaluated in this study were usually installed without bottom liners or containment berms. In the majority of cases, the facility was located in moderate to highly permeable soils within 20 feet of groundwater and 100 feet of a surface water body. In other cases (approximately 25 percent), the facility was located within one-half mile of shallow drinking water wells and was frequently located on sites contiguous to residential properties. The piles were typically located on sites with poor or nonexistent surface drainage control facilities, and usually represented only an intermediate step taken by the facility operator pending a final disposal solution for the piled waste material.

Most of the piles consisted of uncovered sludge deposits installed without adequate collection systems. Hence, leachate from deposited wastes accounted for the majority of the events tabulated for this facility type. Exposure to surface runoff and wind, and leakage from battery casings and various other piled containers were also frequently occurring events.

5.0 Summary Report

5.1 Overview

The study team evaluated and completed DISFs for a total of 929 sites. It is particularly important for the reader, throughout this analysis, to be cognizant of the fact that the 929 sites evaluated were selected based on specific criteria. This criteria included preselection of sites associated with cases having sampling data, cases associated with storage facilities and MITRE scored sites. In view of this preselection process, it should be noted that these sites are not necessarily representative of all damage cases on file at EPA. This negates the possibility of attempting to draw conclusions about the universe of all damage cases based on the findings of this study.

Many of the sites contained multiple facilities. A total of 1,722 facility types were used in describing the sites in the ten regions. Of the 1,722 facility types evaluated, Figure 5-1 indicates that 23 percent were landfills, 22 percent were containers, 16 percent were surface impoundments and 11 percent were tanks. The remaining 28 percent of the facilities were described by various other categories.

Contamination, either documented or suspected, was identified in 834 sites, or 90 percent of the sites evaluated. At 555 of the sites, or 60 percent, contamination was documented. Figure 5-2 indicates that 32 percent of the contamination incidents occurred to groundwater, with the remaining incidents occurring to soil (31 percent), surface water (29 percent) and air (8 percent). Of the 2,019 responses originally indicating contamination, only 856 (42 percent) could be documented using the evaluation criteria developed in Section 3.1.4. Each site was evaluated for damage occurring to life, property and various natural resources. This evaluation focused on six potentially affected areas, including drinking water, food chain, flora, fauna, human health and property. Damage, (either documented or suspected), was identified in at least 544 sites, or 59 percent of the sites evaluated. Figure 5-3 (extreme left bargraph) compares the total number of evaluated sites against the total number of sites rated as "contaminated" and/or "damaged". ("Contaminated sites" shall be interpreted as sites causing contamination to at least one media, "damaged sites" as those resulting in damage to one affected area.) This figure also compares the respective fraction of contaminated sites (middle bargraph) and damaged sites (right bargraph) associated with files having adequate documentation as described in Section 3.1.4.1. Of the 1,171 affected areas indicating damage only 375 (32 percent) could be documented using the evaluation criteria. Figure 5-4 indicates that approximately 34 percent of the documented damage incidents occurred to drinking water, with the remaining incidents occurring to property (28 percent), flora (16 percent), fauna (10 percent), human health (8 percent) and food chain (4 percent). There were 28 incidents involving documented damage to human health. Figure 5-5 indicates that 73 percent of the incidents causing the damage or contamination described above were due to leachate (33 percent), leaks (22 percent), or spills (18 percent). These incidents involved contamination caused by metals, volatile halogenated organics, volatile nonhalogenated organics, acid compounds or base neutral extractables in 70 percent of the incidents tabulated.

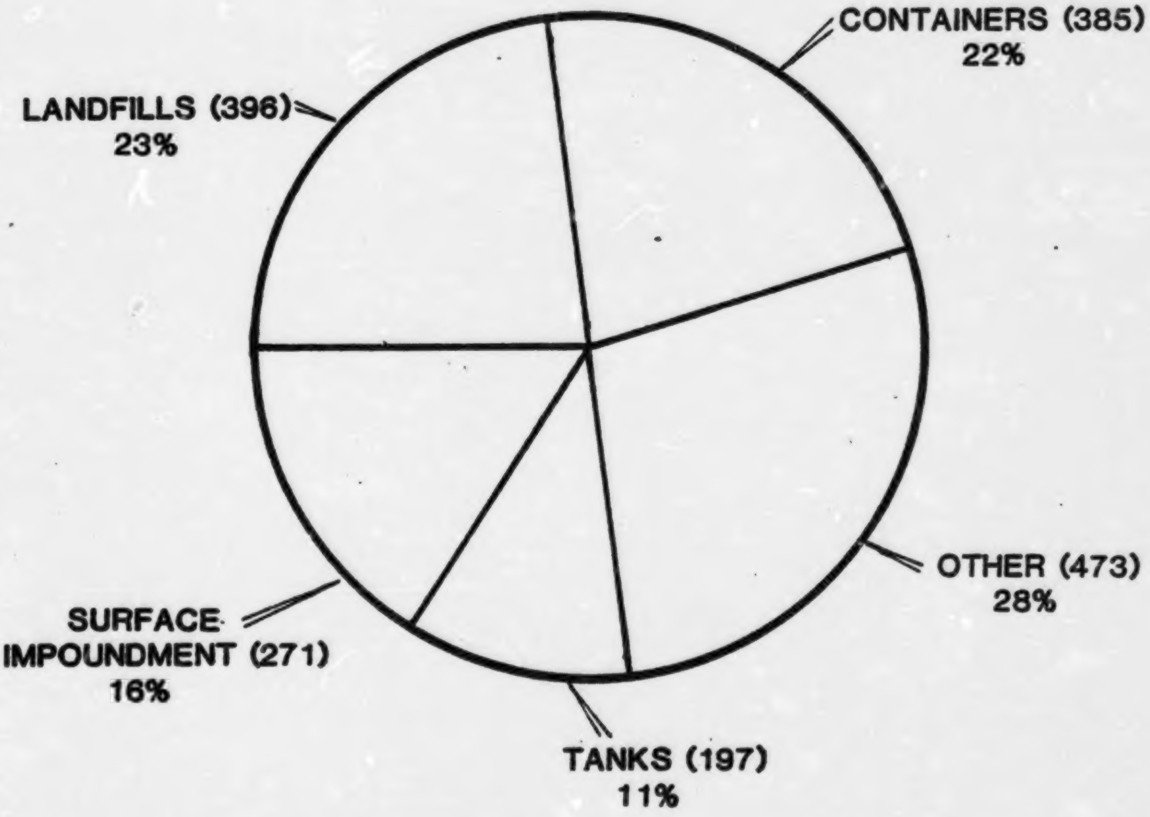
FIGURE 5-1

HAZARDOUS WASTE SITES DISF SUMMARY OF EVALUATED SITES (1)

SITE DESCRIPTIONS BY FACILITY TYPE

TOTAL NUMBER OF FACILITY TYPES TABULATED

1722



(271) FACILITY TYPES TABULATED

NOTE: COMPLETE TABULATION SEE TABLE 5-1

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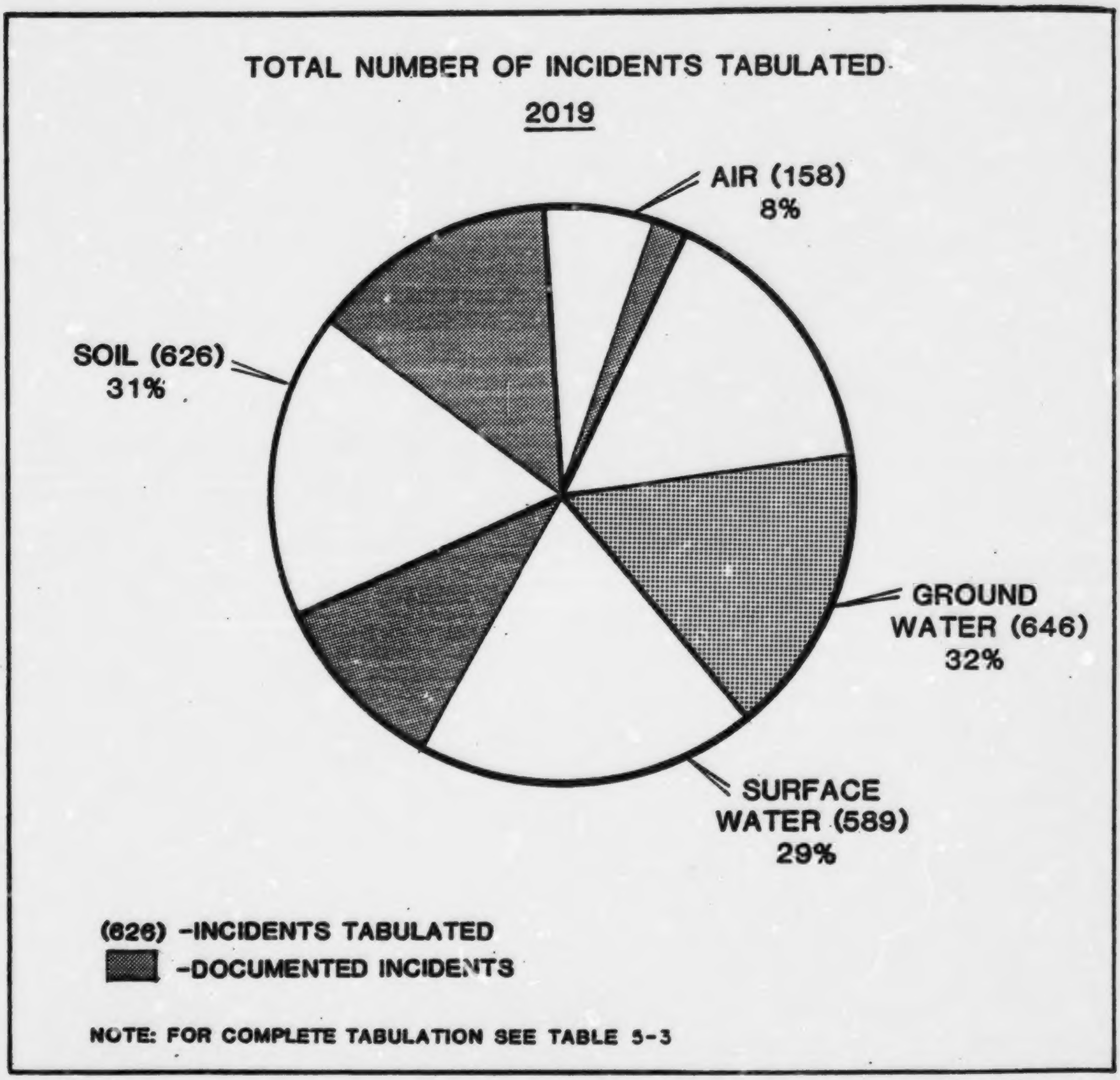
(1) Sampled sites were not randomly selected. Site selection criteria and the implications of this criteria are discussed in detail in Sections 3.1.1 and 3.2.1.

FIGURE 5-2

HAZARDOUS WASTE SITES DISF SUMMARY OF EVALUATED SITES(1)

MEDIA CONTAMINATED



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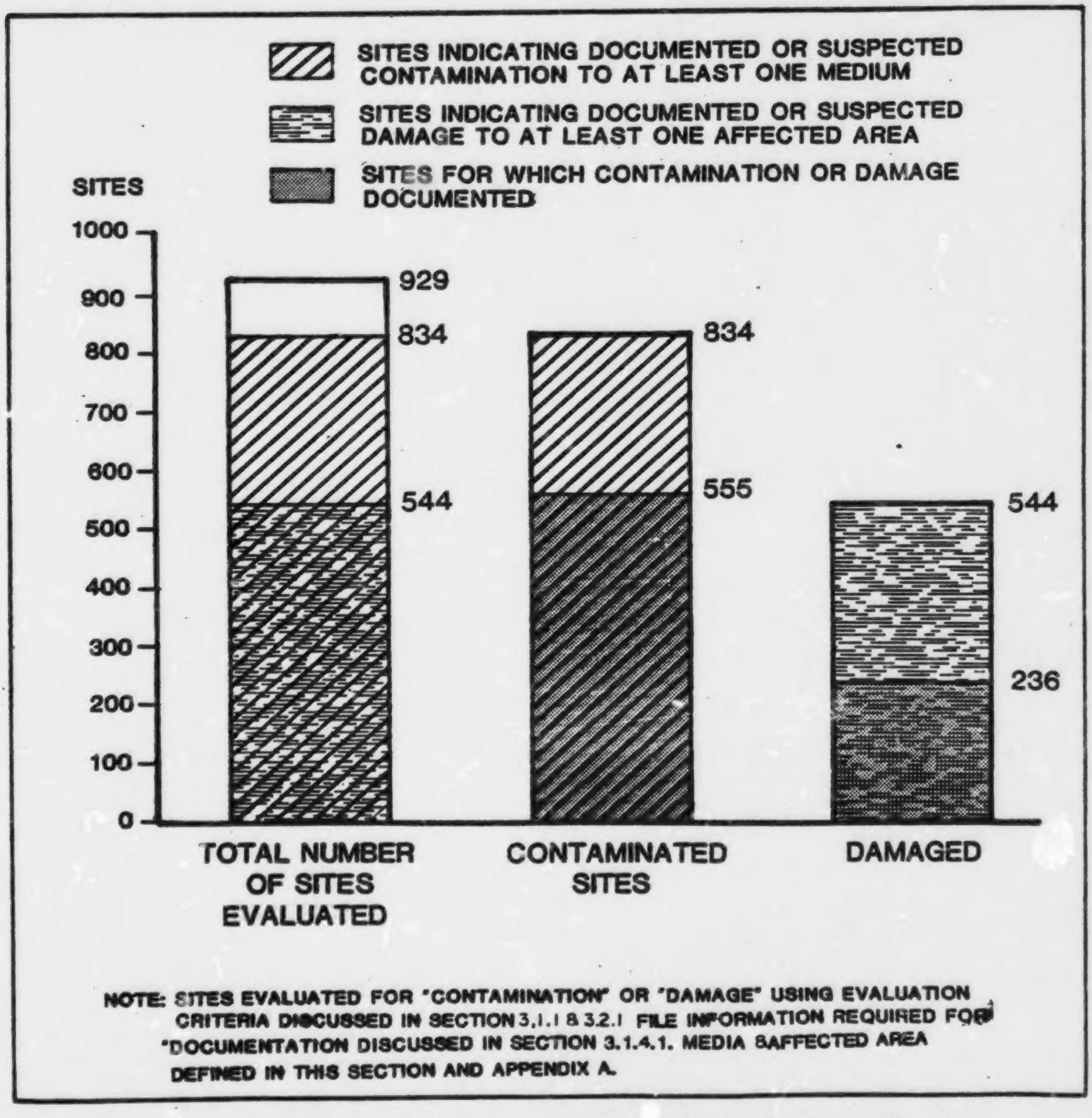
(1) Sampled sites were not randomly selected. Site selection criteria and the implications of this criteria are discussed in detail in Sections 3.1.1 and 3.2.1.

FIGURE 5-3

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES (1)

TABULATION OF SITES CONTAMINATED AND DAMAGED



NOTE: SITES EVALUATED FOR "CONTAMINATION" OR "DAMAGE" USING EVALUATION CRITERIA DISCUSSED IN SECTION 3.1.1 & 3.2.1 FILE INFORMATION REQUIRED FOR "DOCUMENTATION DISCUSSED IN SECTION 3.1.4.1. MEDIA &AFFECTED AREA DEFINED IN THIS SECTION AND APPENDIX A.

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of this criteria are discussed in detail in Sections 3.1.1 and 3.2.1.

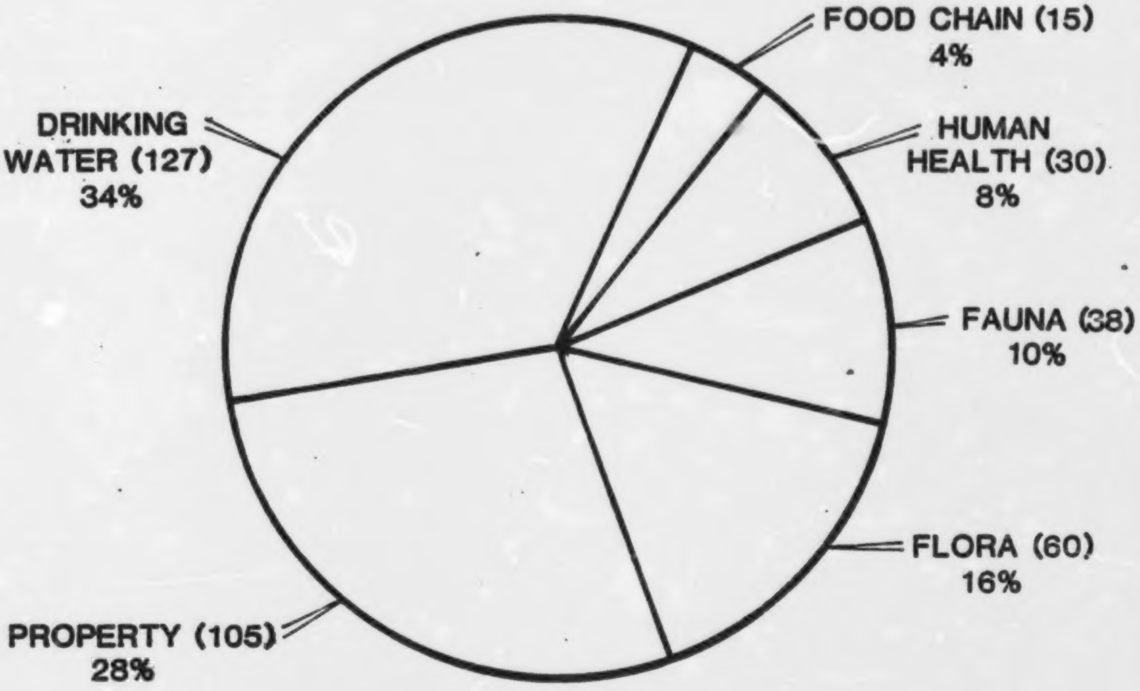
FIGURE 5-4

HAZARDOUS WASTE SITES DISF SUMMARY OF EVALUATED SITES (1)

AFFECTED AREAS DAMAGED DOCUMENTED CASES

TOTAL NUMBER OF AFFECTED AREAS DAMAGED

375



(128) INCIDENTS TABULATED

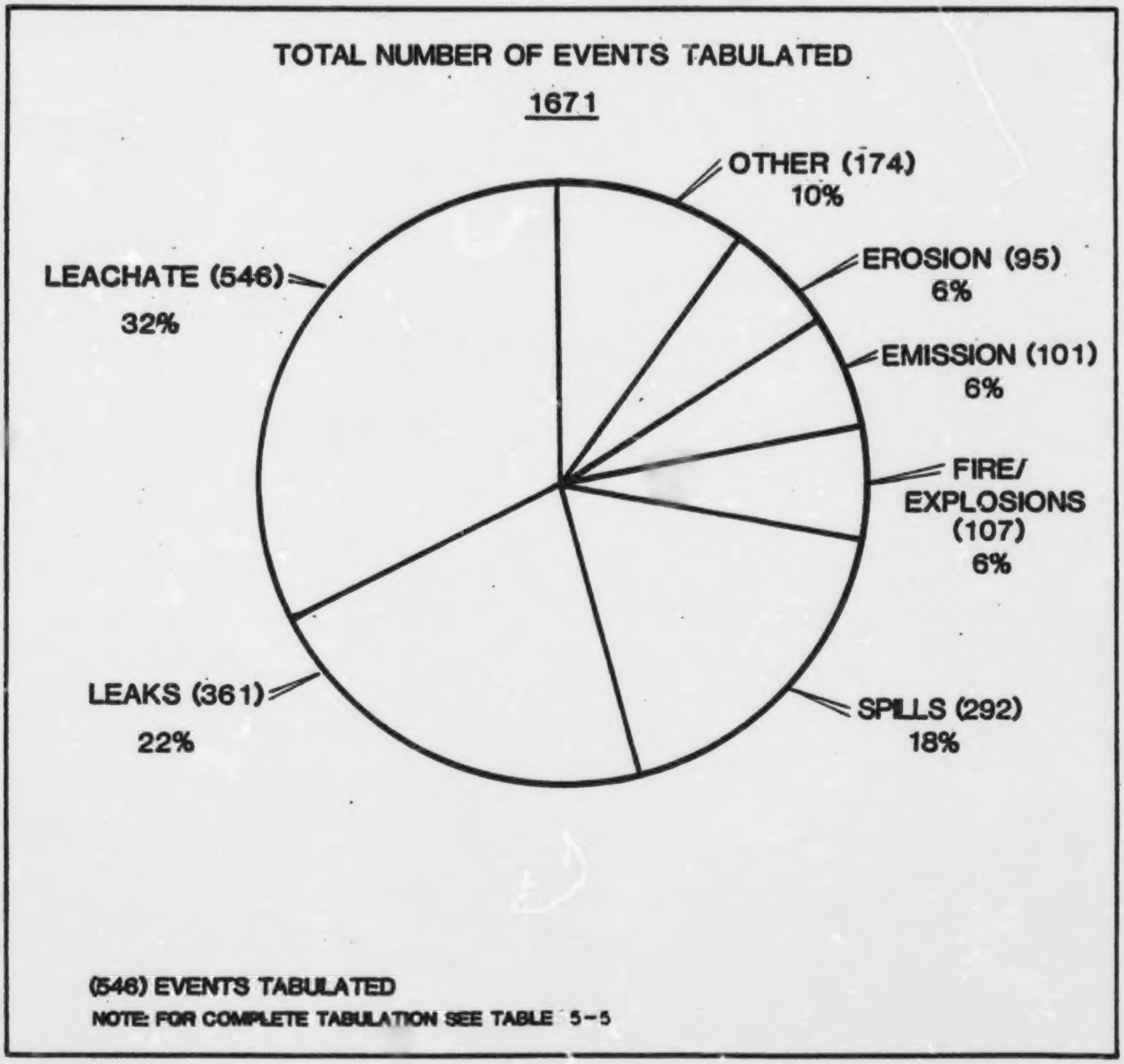
NOTE: FOR COMPLETE TABULATION OF DOCUMENTED AND SUSPECTED CASES SEE TABLE 5-10

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of this criteria are discussed in detail in Sections 3.1.1 and 3.2.1.

FIGURE 5-5

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES (1)

EVENTS CAUSING CONTAMINATION



(1) Sampled sites were not randomly selected. Site selection criteria and the implications of this criteria are discussed in detail in Sections 3.1.1 and 3.2.1.

5.2 Sources

The study team preliminarily identified 1,196 files in Regions I through X for review. File sources included 604 FIT files, 503 S&A files, 60 Uncontrolled Hazardous Waste Site files, 28 Enforcement files and 1 Waste Division Inspection file. Twenty-eight files were not reviewed because a confidentiality agreement had been negotiated between EPA and/or EPA subcontractors and the site owners. Based upon a review of the remaining 1,168 sites, 239 were eliminated from the study because they did not conform to the Selection Criteria summarized in Section 3.1, Table 3-1.

5.3 Tabulation of Site Descriptions by Facility Type

Each site was evaluated and categorized by one or more of the following fourteen site descriptions as listed in Section IIA of the DISFs.

- Landfill Facility
- Open Dump
- Surface Impoundment
- Incinerator
- Injection Well
- Land Treatment
- Transportation Spill Site
- Storage/Treatment Containers
- Storage/Treatment Tanks
- Storage/Treatment Piles
- Boilers Using Waste as Fuel
- Recycling/Reclamation
- Midnight Dump
- Other

For the 929 sites, all of these categories were identified, along with an additional 17 "other" categories not listed in the DISF. These other categories were facilities which did not readily conform to the site descriptions for any of the above. These include wastewater discharges, buried sludge pits, a harbor, an auto repair shop grease pit, chemical/physical treatment, a well field, open burning sites, a creek, an auto parts removal shop, a waste transporter, an abandoned mine, a chemical repackaging facility, a radiation site, a lumber treatment facility, a septic system overflow, reuse of pesticide drums and "unknown" facility sources. Table 5-1 summarizes the total number of facility types used in describing the 929 sites evaluated. Of the 929 sites evaluated, 41 percent were identified as active facilities, and 43 percent as inactive facilities. The remaining 16 percent could not be identified using the information available in the files. Many of the sites contained multiple facilities. A total of 1,722 facility types were used in describing the sites. Of the 1,722 facility types evaluated, 78 percent of the sites were identified as either landfills (23 percent), containers (22 percent), surface impoundments (16 percent), tanks (11 percent) or open dumps (6 percent). A total of 466 sites were described by two or more facility types and 210 sites by three or more facility types.

Figure 5-6 is a probability plot of the operating years of the 354 facilities for which statistics were available. These operating years were based on the opening and closure dates of these facilities. However it should be noted that operating years may not reflect the number of years that the facility received hazardous waste. For example, if a company began

Table 5-1

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITE DESCRIPTIONS BY TYPE

Facility Type	Total Number of Responses Described as Given Facility Type	Percent of Total
Landfill	396	23
Open Dump	95	6
Surface Impoundment	271	16
Incinerator	40	2
Injection Well	15	1
Land Treatment	25	2
Transportation Spill Site	10	1
Storage/Treatment Containers	385	22
Storage/Treatment Tanks	197	11
Storage Treatment Piles	58	3
Boilers Using Waste as a Fuel	5	LT 1
Recycling/Reclamation	84	4
Midnight Dump	84	5
Wastewater Discharge	13	1
Radiation Sites	6	LT 1
Other	38	2
Total	1,722	100

LT = less than

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Section 3.1.1. and 3.2.1.

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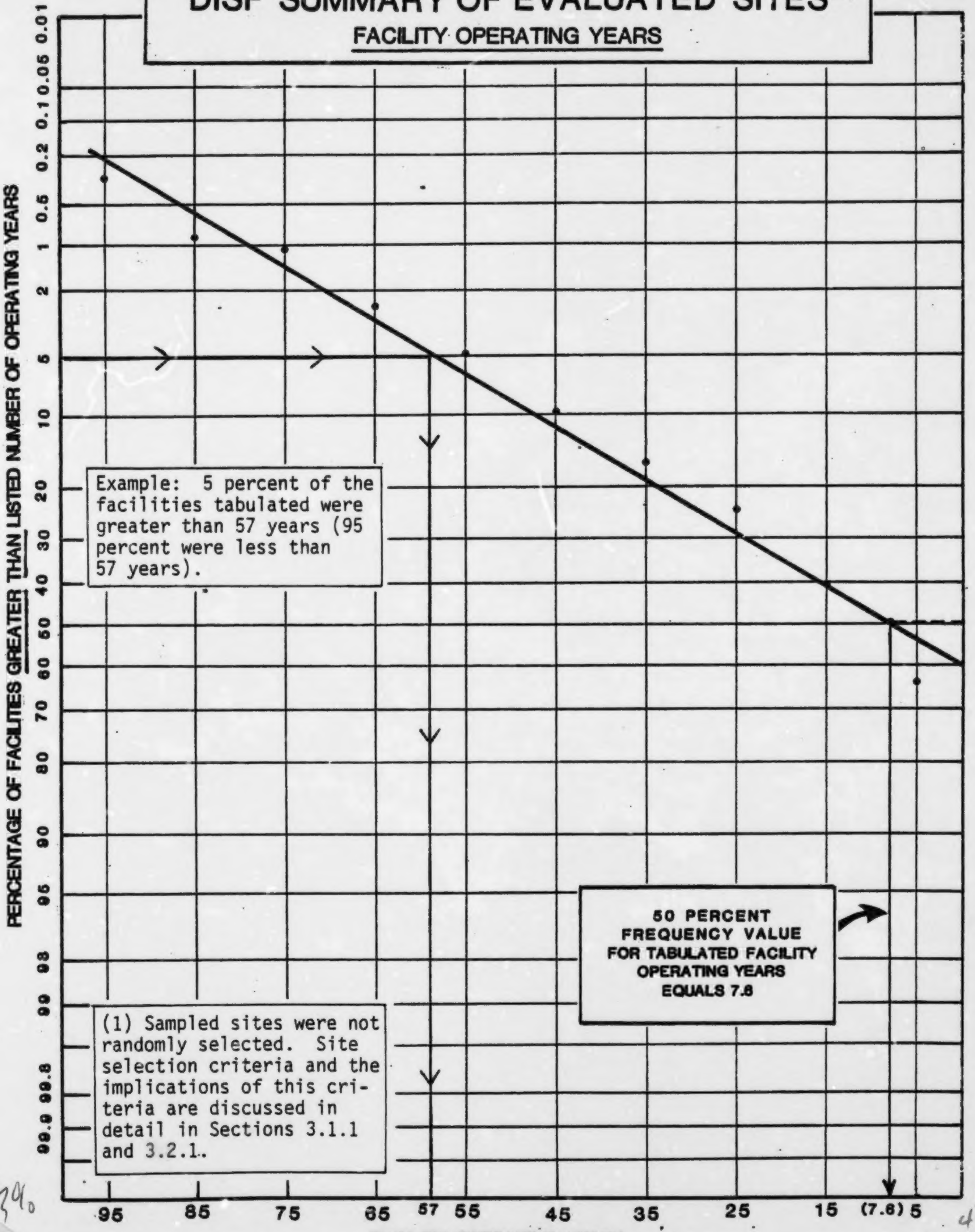
FIGURE 5-6

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

FACILITY OPERATING YEARS



Example: 5 percent of the facilities tabulated were greater than 57 years (95 percent were less than 57 years).

50 PERCENT FREQUENCY VALUE FOR TABULATED FACILITY OPERATING YEARS EQUALS 7.8

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of this criteria are discussed in detail in Sections 3.1.1 and 3.2.1.

1390

(A)

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operation in 1952, installed a surface impoundment at some later date and closed in 1978, the operating years of the facility would be tabulated as 26, although the age of the surface impoundment is actually less. This analysis indicates that at the time of this study two-thirds of the facilities had been operating between one and 38 years with the average (50 percent frequency value) estimated at 7.6 years.

5.4 Contamination Incidents

Four media, i.e. groundwater, surface water, air and soil, were evaluated for site-related contamination in Section V of the DISF. In the remainder of this section, contamination will be interpreted to mean both documented and suspected incidents/events, unless otherwise noted. Sites indicating the absence of contamination, and/or files not containing sufficient information to determine the presence of contamination, were also identified. Table 5-2 summarizes the number of sites with contamination in at least one of the media.

Most of the contamination originating from these sites was discovered between 1979 and 1981, a time period coinciding with the initiation of most state and federal hazardous waste monitoring programs. For this reason an accurate assessment of the time period during which site related contamination has been occurring could not be identified. Contamination incidents were identified at 834 sites, or 90 percent of the sites evaluated.

A total of 2,019 incidents involving various media were recorded at these sites, of which 856 (42 percent) incidents could be documented by sampling and analytical data. Six hundred seventy-six sites were identified with contamination in two or more media. For example, of the 626 sites indicating soil contamination, 367 sites also indicated groundwater contamination. File data indicated that 792 sites were contaminated from incident(s) occurring at the site evaluated. File data for the remaining 42 sites indicated that contamination may have originated off-site.

5.4.1 Tabulation of Media Exposed to Contamination. Table 5-3 summarizes the total number of DISF responses indicating contamination or the absence of contamination by media. Site files containing insufficient information to determine contamination were also recorded for each of the media evaluated and noted under the appropriate heading in Table 5-3. This table indicates that 32 percent of the contamination incidents occurred to groundwater. The remaining incidents occurred to either soil (31 percent), surface water (29 percent) or air (8 percent).

5.4.2 Tabulation of Media Exposed to Contamination Incidents by Facility Type. Table 5-4 summarizes the total number of DISF responses indicating media contamination associated with each facility type. This analysis suggests that approximately 76 percent of the sites associated with contamination incidents were identified as either landfills (24 percent), containers (22 percent), surface impoundments (19 percent) or tanks (11 percent). Table 5-4 indicates that, for most of the incidents tabulated, in decreasing order of occurrence, contamination to:

- groundwater was associated with landfills, surface impoundments, containers and tanks;

(48) 48

Table 5-2

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES EXPOSED TO CONTAMINATION INCIDENTS

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented contamination (to at least one medium)	555	60
2	Sites indicating suspected contamination (to at least one medium) and not identified by Category 1 above	279	30
3	Sites indicating documented or suspected absence of contamination and not identified by Categories 1 and 2 above	61	7
4	Sites for which there was an absence of sufficient information in the file to make a determination of contamination, and not identified by Categories 1, 2 or 3 above	34	4
	TOTAL SITES	929	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

Table 5-3

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT

Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
	Documented	Suspected	Documented	Suspected		
Groundwater	320	326	35	119	129	929
Surface Water	209	380	27	142	171	929
Air	39	119	3	464	304	929
Soil	288	338	6	152	145	929

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

(50)

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Table 5-4

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[(1)]

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT BY FACILITY TYPE

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Landfill	Groundwater	108	193	22	34	39	396
	Surface Water	76	185	11	61	63	396
	Air	17	44	2	193	140	396
	Soil	64	167	4	74	87	396
Open Dump	Groundwater	10	55	3	9	18	95
	Surface Water	21	52	1	5	16	95
	Air	2	11	0	45	37	95
	Soil	30	47	0	6	12	95
Surface Impoundment	Groundwater	75	149	11	20	16	271
	Surface Water	64	139	7	22	39	271
	Air	1	43	1	141	85	271
	Soil	77	133	2	27	32	271
Incinerator	Groundwater	2	0	1	28	9	40
	Surface Water	1	1	0	26	12	40
	Air	1	15	0	16	12	40
	Soil	1	2	1	23	9	40

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

(57)

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Table 5-4 (cont'd)[1]

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Injection Well	Groundwater	4	5	0	2	4	15
	Surface Water	2	4	0	2	7	15
	Air	0	4	0	7	4	15
	Soil	1	6	0	3	5	15
Land Treatment	Groundwater	4	12	2	5	2	25
	Surface Water	1	14	1	8	1	25
	Air	0	5	0	17	3	25
	Soil	4	14	0	5	2	25
Transportation Spill Site	Groundwater	3	2	0	3	2	10
	Surface Water	1	2	1	3	3	10
	Air	0	2	0	5	3	10
	Soil	4	4	1	1	0	10
Storage Treatment Containers	Groundwater	42	179	11	78	75	385
	Surface Water	41	170	11	77	86	385
	Air	6	62	0	175	142	385
	Soil	90	178	2	65	50	385
Storage Treatment Tanks	Groundwater	24	83	3	46	41	197
	Surface Water	21	84	3	43	46	197
	Air	0	36	0	102	59	197
	Soil	40	88	1	30	36	197

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

Table 5-4 (cont'd)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Storage Treatment Piles	Groundwater	8	26	2	8	12	56
	Surface Water	10	34	1	5	6	56
	Air	1	19	0	25	11	56
	Soil	20	25	0	7	4	56
Boilers Using Waste as Fuel	Groundwater	0	1	0	2	2	5
	Surface Water	0	0	0	2	3	5
	Air	1	0	0	2	2	5
	Soil	0	1	0	2	2	5
Recycling Reclamation	Groundwater	8	41	1	17	17	84
	Surface Water	4	42	2	16	20	84
	Air	1	19	0	47	17	84
	Soil	16	34	0	16	17	84
Midnight Dump	Groundwater	9	52	2	5	16	84
	Surface Water	7	51	2	4	20	84
	Air	3	10	1	31	39	84
	Soil	16	50	0	2	16	84
Radiation	Groundwater	0	1	0	2	3	6
	Surface Water	0	1	0	2	3	6
	Air	1	1	0	0	4	6
	Soil	3	0	0	0	2	6

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

- surface water was associated with landfills, containers, surface impoundments and tanks;
- soil was associated with containers, landfills, surface impoundments and tanks; and
- air was associated with containers, landfills, surface impoundments, and tanks.

5.5 Events Causing Contamination

Contaminated sites were associated with one or more of the following events, as outlined in Section VIII of the DISF.

.Fire/Explosion
.Spill
.Leak
.Flood
.Seismic Activity
.Erosion
.Leachate
.Emission of Toxic Gases/Mists

In the remainder of this section, events tabulated will include both documented and suspected events, unless otherwise noted.

All of these events were identified at least once, along with six other types not listed in the DISF. These other events were described as a wastewater discharge, uncontrolled surface runoff, drain overflow, liquid discharge, radiation exposure and "unknown." A total of 310 sites (33 percent) were involved in two events and 239 sites (26 percent) in 3 or more events.

5.5.1 Tabulation of Events Causing Contamination Incidents. Table 5-5 summarizes the total number of events causing contamination incidents. In total, 1,671 contamination events involving various facility types were recorded in the DISFs. This tabulation indicates that approximately 73 percent of the contamination events were related to leachate (33 percent), leaks (22 percent) or spills (18 percent). Of the 1,671 contaminated events tabulated, 810 (48 percent) could be documented from information available in the file.

5.5.2 Tabulation of Events Causing Contamination Incidents By Facility Type. Table 5-6 summarizes the events causing contamination incidents at various facility types. Figure 5-7 compares the total number of events and event types tabulated as a percent of the total evaluated for individual facility types. This figure indicates that leachate, leaks and spills were events common to most facility types. Since a number of sites contained a multiple number of facilities, there were a number of cases where there was insufficient information available in the file to identify the damage incident with the specific facility unit in question. These represented approximately 13 percent of the total and are identified in Table 5-6.

This analysis also indicates that approximately 73 percent of the leachate events were associated with landfills (38 percent), surface impoundments (20 percent) or containers (15 percent). Leaks were found to occur primarily at container storage facilities. Approximately 90 percent

(54) 54

Table 5-5

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS

Event	Documented	Suspected	Total
Fire/Explosion	66	36	102
Spills	142	150	292
Leaks	136	225	361
Flood	19	31	50
Seismic Activity	0	2	2
Erosion	51	44	95
Leachate	272	274	546
Emission of Toxic Gases/Mists	34	67	101
Other	90	32	122
Total	810	861	1,671

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

(55)

55

Table 5-6

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS BY FACILITY TYPE

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Landfill	Fire/Explosion	18	22	2	42
	Spills	11	27	4	42
	Leaks	13	48	4	65
	Flood	7	11	0	15
	Seismic Activity	0	1	0	1
	Erosion	29	16	1	45
	Leachate	148	180	7	335
	Emission of Toxic Gases/Mists	12	28	1	42
	Other	13	5	0	18
Open Dump	Fire/Explosion	6	10	2	18
	Spills	17	21	2	40
	Leaks	14	24	1	39
	Flood	1	2	0	3
	Seismic Activity	0	1	0	1
	Erosion	6	7	0	13
	Leachate	20	37	2	59
	Emission of Toxic Gases/Mists	1	8	0	9
	Other	5	3	0	8
Surface Impoundments	Fire/Explosion	3	8	1	12
	Spills	21	47	6	74
	Leaks	29	101	7	137
	Flood	10	15	0	25
	Seismic Activity	0	2	0	2
	Erosion	9	19	3	31
	Leachate	49	125	1	175
	Emission of Toxic Gases/Mists	3	19	1	23
	Other	17	4	0	21

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

Table 5-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Incinerator	Fire/Explosion	0	0	0	0
	Spills	1	3	4	8
	Leaks	0	6	5	11
	Flood	0	1	1	2
	Seismic Activity	0	0	0	0
	Erosion	0	0	2	2
	Leachate	0	3	5	8
	Emission of Toxic Gases/Mists	2	10	2	14
	Other	0	2	1	3
Injection Well	Fire/Explosion	0	0	0	0
	Spills	0	1	1	2
	Leaks	0	3	0	3
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	6	0	7
	Emission of Toxic Gases/Mists	1	1	0	2
	Other	4	2	0	6
Land Treatment	Fire/Explosion	0	0	0	0
	Spills	2	0	2	4
	Leaks	2	0	0	2
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	5	1	6
	Leachate	3	14	3	20
	Emission of Toxic Gases/Mists	0	2	0	2
	Other	3	0	0	3
Transportation Spill Site	Fire/Explosion	0	0	0	0
	Spills	8	1	0	9
	Leaks	4	1	0	5
	Flood	0	1	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	3	2	0	5
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	1	0	0	1

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

Table 5-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Storage Treatment Containers	Fire/Explosion	25	18	7	50
	Spills	54	106	15	175
	Leaks	63	146	13	222
	Flood	4	4	1	9
	Seismic Activity	0	0	0	0
	Erosion	2	10	2	14
	Leachate	31	103	5	139
	Emission of Toxic Gases/Mists	6	34	6	46
	Other	14	8	2	24
Storage Treatment Tanks	Fire/Explosion	5	9	6	20
	Spills	33	58	9	100
	Leaks	28	59	12	99
	Flood	1	4	1	6
	Seismic Activity	0	0	0	0
	Erosion	1	0	1	2
	Leachate	11	37	2	50
	Emission of Toxic Gases/Mists	1	13	4	18
	Other	5	5	0	10
Storage Treatment Piles	Fire/Explosion	1	3	0	4
	Spills	4	5	0	9
	Leaks	3	6	2	11
	Flood	0	0	0	0
	Seismic Activity	0	1	0	1
	Erosion	2	6	0	8
	Leachate	11	15	3	29
	Emission of Toxic Gases/Mists	0	3	0	3
	Other	5	9	0	14
Boilers Using Waste as Fuel	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	1	0	0	1
	Other	0	0	1	1

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

Table 5-6 (cont'd)(1)

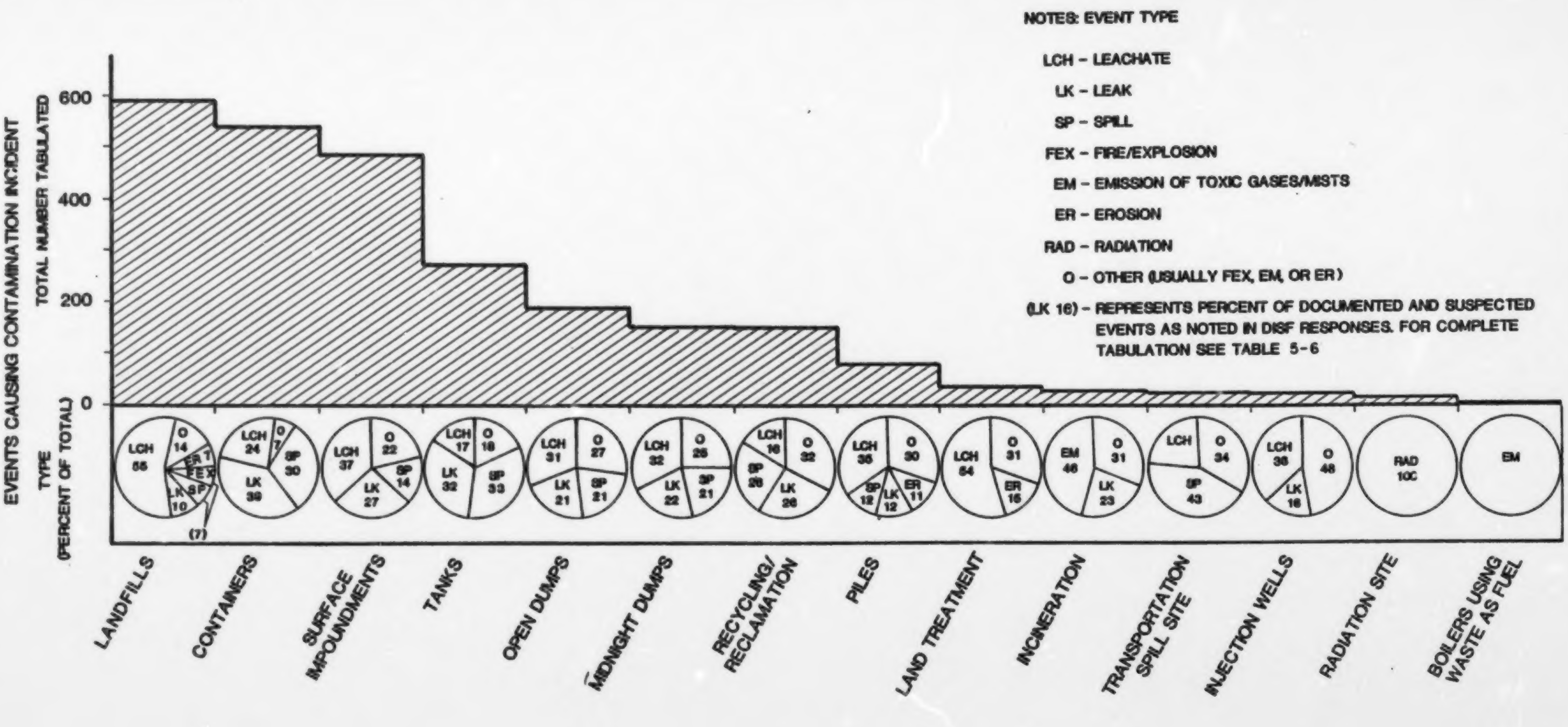
Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Recycling Reclamation	Fire/Explosion	6	5	1	12
	Spills	10	29	6	45
	Leaks	9	29	6	44
	Flood	2	6	0	8
	Seismic Activity	0	0	0	0
	Erosion	0	4	1	5
	Leachate	6	18	2	26
	Emission of Toxic Gases/Mists	2	7	3	12
	Other	6	9	0	15
Midnight Dump	Fire/Explosion	4	5	6	15
	Spills	15	16	7	38
	Leaks	10	24	7	41
	Flood	2	1	0	1
	Seismic Activity	0	0	1	1
	Erosion	2	2	3	7
	Leachate	9	39	5	53
	Emission of Toxic Gases/Mists	1	8	1	10
	Other	7	3	1	11
Radiation Site	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	6	1	0	7

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

FIGURE 5-7

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES

EVENTS CAUSING CONTAMINATION INCIDENT BY FACILITY TYPE



NOTES: EVENT TYPE

LCH - LEACHATE
LK - LEAK
SP - SPILL
FEX - FIRE/EXPLOSION
EM - EMISSION OF TOXIC GASES/MISTS
ER - EROSION
RAD - RADIATION
O - OTHER (USUALLY FEX, EM, OR ER)
(LK 16) - REPRESENTS PERCENT OF DOCUMENTED AND SUSPECTED EVENTS AS NOTED IN DISF RESPONSES. FOR COMPLETE TABULATION SEE TABLE 5-6

of the spill events were associated with containers (33 percent), tanks (19 percent), surface impoundments (14 percent), recycling/reclamation (8 percent), landfills (8 percent) and open dumps (8 percent). Air pollution events, i.e., emissions of toxic gases and mists, were most commonly associated with containers (25 percent) and landfills (25 percent). Facilities having the highest frequency of fires and explosions were containers (29 percent) and landfills (27 percent).

5.6 Chemicals Documented in Contamination Incidents

For this analysis, chemical compounds were organized into the following general categories:

- Volatile Halogenated Organics (VHOs)
- Volatile Non-halogenated Organics (VNHOs)
- Base Neutral Extractables (BNEs)
- Pesticides
- PCBs
- Metals
- Oil
- Ammonia/Ammonia Compounds
- Asbestos
- Inorganics
- Cyanide
- Acids
- Acid Compounds
- Alkalies
- Alcohols
- Aldehydes
- Ketones
- Radioactive

Table 5-7 summarizes the total number of times that a chemical in a given category was positively identified by sampling and analytical techniques as occurring as contaminants in the various media. Although this table suggests that the highest percentage of documented contamination incidents were from metals (23 percent), VHOs (17 percent) and VNHOs (12 percent) it should be noted that the analytical procedures selected were based on the judgement of the original field investigator and may not have accurately represented the range of potential contaminants at the site. Based on the waste types reported at the sites evaluated in this study, it is suspected that a priority pollutant analysis may have indicated the presence of contaminants less frequently identified in this study (BNEs, acid compounds, pesticides, PCBs, inorganics, cyanide, acids, oil, etc).

Sixteen of these chemical categories were identified at least once, along with several additional categories not listed above. These other categories included greases, esters, mercaptan, varsol, sodium chlorate, fecal coliform and aromatics. This tabulation indicates that approximately 70 percent of the chemical categories were identified as either metals (23 percent), VHOs (17 percent), VNHOs (12 percent), BNEs (9 percent) or acid compounds (9 percent). Table 5-8 lists the most commonly occurring chemicals found in each of these categories, and the range of concentrations observed in the affected media.

Table 5-7

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF CHEMICALS DOCUMENTED IN CONTAMINATION INCIDENTS

Chemical Category	Total Positive Identifications	Percent of Total
Volatile Halogenated Organics (VHOs)	233	17
Volatile Non-halogenated Organics (VNHOs)	159	12
Base Neutral Extractables (BNEs)	117	9
Pesticides	85	6
PCBs	82	6
Metals	316	23
Oil	26	2
Ammonia/Ammonia Compounds	18	1
Inorganics	60	5
Cyanide	40	3
Acids	37	3
Acid Compounds	127	9
Alkalies	1	LT 1
Alcohols	7	LT 1
Aldehydes	2	LT 1
Ketones	17	1
Radioactive	9	LT 1
Asbestos	3	LT 1
Others	8	LT 1
Total	1,347	100

LT = less than

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1

(62)

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Table 5-8

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

Most Frequently Observed Chemical Category	Common Contaminants	Contaminant Concentration Ranges: Groundwater (mg/l)	Surface Water (mg/l)	Soil (mg/l)	Air (mg/l)	USEPA (a) Human Health Criteria 10^{-6}	USEPA (b) Primary Drinking Water Standards	USEPA (c) Drinking Water Standards
VHOs	1,1,1, trichloroethane	trace-12.0	trace-1.8	trace-1.4	1,062.8	NS	NS	NS
	trichloroethylene	0.0-315.0	trace-7.50	trace-0.10	ND	2.7 ug/l	NS	NS
	dichloromethane	0.132-19.0	trace-250	0.034	ND	NS	NS	NS
	tetrachloroethylene	0.0-4.6	0.425	trace-20.5	ND	0.8 ug/l	NS	NS
	chlorobenzene	0.177	0.02	ND	ND	NS	NS	NS
	dibromoethane	ND	ND	1.6	ND	NS	NS	NS
VNHOs	benzene	0.001-80	trace-22.0	trace-43.0	ND	0.66 ug/l	NS	NS
	toluene	0.0009-64.8	trace-6.572	trace 64.0	719	NS	NS	NS
	xylene	0.001-18.8	trace-1.70	2.0-3.8	ND	NS	NS	NS
Metals	lead	0.001-810	trace-175	trace-5,750	ND	NS	0.05 mg/l	NS
	manganese	0.012-120	trace-8,900	ND	ND	NS	NS	0.05 mg/l
	chromium	trace-65.5	0.001-10	0.110-31,765	ND	NS	0.05 mg/l	NS
	cadmium	0.02-0.1	0.1-1.0	4.1	ND	NS	NS	NS
	nickel	0.029-5.50	ND	0.076-0.49	ND	NS	NS	NS
	arsenic	0.001-2.4	0.0-16	trace-510	ND	2.2 ng/l	0.05 mg/l	NS
	mercury	ND	0.0-0.001	0.0-734	ND	NS	0.002 mg/l	NS
Acid Compounds	pentachlorophenol	0.0003	ND	0.9-46	ND	NS	NS	NS
	phenol	0.0001-2.3	0.011-6.920	trace-22.5	ND	NS	NS	NS

NOTES: ND = no data available
NS = no standard

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

SOURCE:
a. U.S. Environmental Protection Agency, November 28, 1980. Water Quality Criteria Documents; Availability. Federal Register, Vol. 45, No. 231.
b. U.S. Environmental Protection Agency, December 24, 1975. National Interim Primary Drinking Water Regulations. 40 CFR 141; 40 FR 59565, as amended.
c. U.S. Environmental Protection Agency, July 19, 1979. National Secondary Drinking Water Regulations. 40 CFR 143; 44 FR 42198. Effective January 19, 1981.

5.7 Damage Incidents

The following six affected areas were evaluated for site related damage on the DISF.

- Drinking Water
- Food Chain
- Flora
- Fauna
- Human Health
- Property Damage

In the remainder of this section damage will be interpreted to mean both documented and suspected incidents/events unless otherwise noted.

Damage was identified for at least 544 sites, or 59 percent, of the sites evaluated. As noted in Section 5.4, higher percentages of the sites indicated contamination (90 percent). Damage was indicated in approximately 63 percent of the contaminated sites evaluated. Of the 1,171 affected areas indicating damage, only 375 (32 percent) could be documented using the evaluation criteria.

Sites indicating the absence of damage, and/or files not containing sufficient information to determine damage, were also identified. A tabulation of sites identified with damage for at least one of the above categories is outlined in Table 5-9.

Of note, are the 330 sites (36 percent) identified as having damage to two or more affected areas. Of the 626 sites indicating soil contamination, 233 sites also indicated damage to drinking water. Also, of the 722 sites indicating soil and/or surface water contamination, 260 sites also indicated damage to flora, fauna or the food chain.

5.7.1 Tabulation of Number, Type and Severity of Damage Incidents. Table 5-10 summarizes the total number of DISF responses indicating damage to the above affected areas. Site files not containing sufficient information to determine damage were also recorded and noted under the appropriate heading in Table 5-10.

Table 5-10 indicates that 34 percent of the documented damage incidents occurred to drinking water, with the remaining incidents occurring to property (29 percent), flora (15 percent), fauna (10 percent) and human health and food chain (12 percent). Table 5-10 also indicates that of the 929 sites evaluated, 160 sites (17 percent) indicated high environmental damage, 151 sites (17 percent) indicated medium environmental damage and 287 sites (31 percent) indicated low environmental damage. The remaining 331 site files indicated no apparent damage (14 percent) or did not have enough information available (22 percent) to make an evaluation. Of note, are the files associated with the 189 sites (20 percent) that suggested that the actual damage may be higher than the response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

Table 5-9

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES DAMAGED

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented damage (to at least one affected area)	236	25
2	Sites indicating suspected damage (to at least one affected area) and not identified by Category 1 above.	308	33
3	Sites indicating documented or suspected absence of damage and not identified by Categories 1 and 2, above	162	17
4	Sites for which there was an absence of sufficient information in the file to make a determination of damage and not identified by Categories 1,2 and 3 above	223	24
	TOTAL SITES	929	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

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Table 5-10

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY OF DAMAGE INCIDENTS

	Damage		No Damage		Insufficient Information Available in File	Total
Affected Area	Documented	Suspected	Documented	Suspected		
Drinking Water	128	213	51	273	264	929
Food Chain	16	81	0	445	387	929
Flora	58	117	3	384	367	929
Fauna	39	123	1	396	370	929
Human Health	28	209	1	372	319	929
Property Damage	106	53	1	417	352	929

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	160	151	287	206	125	929
Human Health	11	63	89	372	394	929

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

The analysis also indicated that out of the 929 sites evaluated, 11 sites indicated high human health damage, 63 sites (6 percent) indicated medium human health damage and 89 sites (10 percent) indicated low human health damage. The remaining 766 sites indicated either no apparent damage (i.e., there was no data available on public health damages) (42 percent) or while there was some data, there was not enough information available to make an evaluation (39 percent). Of note, are the files associated with 224 sites (24 percent) that suggested that the actual human health damage may be higher than the severity response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating. The total number of sites indicating various degress of environmental or human health damage are graphically displayed in Figure 5-8.

5.7.2 Tabulation of Number and Severity of Damage Incidents by Facility Type. Table 5-11 summarizes the DISF responses indicating damage to each affected area by associated facility type. This analysis indicates that approximately 87 percent of the damage incidents were associated with landfills (24 percent), containers (21 percent), surface impoundments (19 percent) tanks (10 percent), midnight dumps (7 percent) or open dumps (6 percent). The remaining percent of the damage incidents were associated with piles, recycling/reclamation facilities, land treatment, injection wells and 4 other categories. A detailed breakdown of damage incidents by facility type is tabulated in Table 5-11. Figure 5-9 compares the total number of damage incidents and affected areas tabulated as a percent of the total evaluated for each facility type. This figure indicates that drinking water represented the area impacted most frequently for each facility type evaluated, excluding incinerators, recycling/reclamation facilities and boilers using waste as fuel. (There were no damage cases recorded for the latter facility type). Drinking water represented between 20 and 33 percent of the affected areas damaged for most of the facility types.

Table 5-11 also indicates that 76 percent of the incidents involving damage to drinking water involved landfills (27 percent), containers (21 percent), surface impoundments (19 percent) and tanks (9 percent). Table 5-11 also identifies the severity of damage to environment and/or human health, based on the tabulation of damage assessments (high, medium, low or none) applying the DISF evaluation guidelines. Landfills, surface impoundments, containers, tanks, open dumps and recycling/reclamation facilities resulted in 86 percent of the cases involving high or medium environmental damage. Eighty-one percent of the cases involving high or medium human health damage were attributed to landfills, containers, surface impoundments, tanks and midnight dumps.

5.8 Status of Response

As noted previously (Sections 5.1, 5.4), the majority of the sites evaluated were identified with some form of environmental contamination, either suspected or documented. Table 5-12 summarizes the status of each site evaluated from the standpoint of enforcement, investigative and remedial activites. This table indicates that 19 percent of the files evaluated indicated that the sites identified were involved in either past or present legal or enforcement actions. However, 511 (55 percent) site files indicated that additional environmental investigations were in progress or completed. Two hundred eighty-two (30 percent) sites were reported to be involved with past or present remedial activities.

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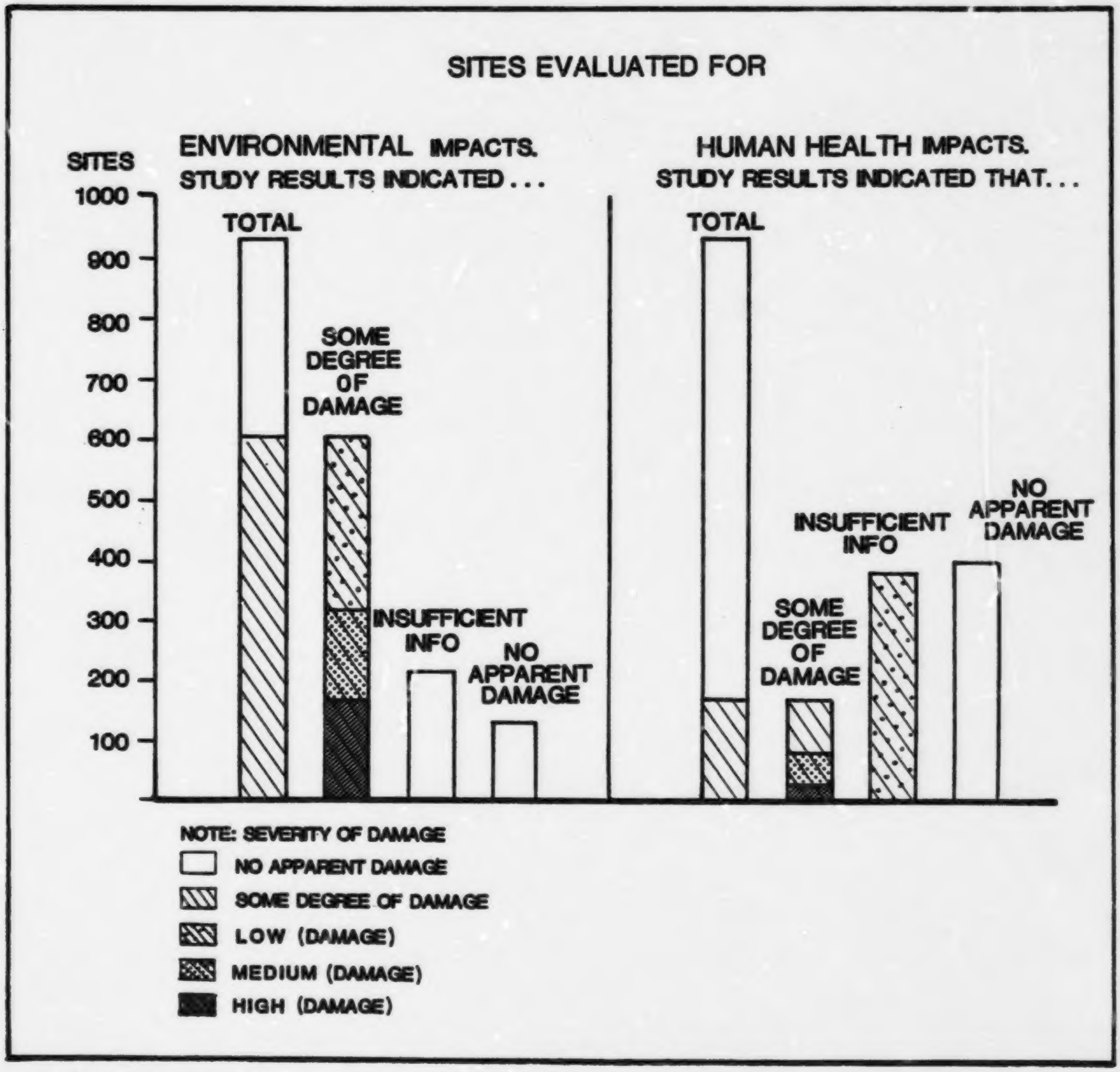
FIGURE 5-8

HAZARDOUS WASTE SITES DISF SUMMARY OF EVALUATED SITES (1)

SEVERITY OF DAMAGE



(1) Sampled sites were not randomly selected. Site selection criteria and the implications of this criteria are discussed in detail in Sections 3.1.1 and 3.2.1.

Table 5-11

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY DAMAGE INCIDENTS BY FACILITY TYPE

Landfill

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	29	122	27	101	117	396
Food Chain	2	38	0	195	161	396
Flora	14	59	3	153	167	396
Fauna	8	65	1	175	147	396
Human Health	5	80	1	159	151	396
Property Damage	17	47	1	180	151	396

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	55	51	87	141	62	396
Human Health	2	14	25	192	163	396

Open Dump

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	15	22	4	24	30	95
Food Chain	2	12	0	40	41	95
Flora	7	14	0	35	39	95
Fauna	4	17	0	33	41	95
Human Health	3	20	0	32	39	95
Property Damage	4	9	0	46	36	95

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	12	18	22	37	6	95
Human Health	0	3	13	48	31	95

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

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Table 5-11 (cont'd) (1)

Surface Impoundments

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	25	83	15	81	67	271
Food Chain	3	40	0	124	104	271
Flora	13	40	0	114	104	271
Fauna	13	50	1	114	93	271
Human Health	1	70	0	107	93	271
Property Damage	12	37	0	118	104	271

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	40	50	75	84	22	271
Human Health	2	11	37	119	102	271

Incinerator

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	1	0	24	15	40
Food Chain	0	0	0	22	18	40
Flora	1	0	0	22	17	40
Fauna	0	0	0	21	19	40
Human Health	1	6	0	14	19	40
Property Damage	0	1	0	21	18	40

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	3	6	22	8	40
Human Health	0	1	2	24	13	40

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

Table 5-11 (cont'd)(1)

Injection Well

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	1	6	1	3	4	15
Food Chain	0	2	0	4	9	15
Flora	0	2	0	6	7	15
Fauna	0	2	0	6	7	15
Human Health	0	4	0	4	7	15
Property Damage	2	2	0	4	7	15

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	3	4	5	2	15
Human Health	0	0	3	6	6	15

Land Treatment

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	2	7	2	10	4	25
Food Chain	0	4	0	16	5	25
Flora	1	3	0	16	5	25
Fauna	0	1	0	17	7	25
Human Health	0	5	0	14	6	25
Property Damage	2	4	0	13	6	25

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	3	8	4	8	25
Human Health	0	0	1	11	13	25

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

Table 5-11 (cont'd)(1)

Transportation Spill Site

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	2	1	0	4	3	10
Food Chain	0	1	0	5	4	10
Flora	0	1	0	5	4	10
Fauna	0	0	0	6	4	10
Human Health	0	6	0	2	2	10
Property Damage	2	2	0	3	3	10

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	3	1	3	2	10
Human Health	0	1	3	3	3	10

Storage Treatment Containers

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	17	99	11	138	120	385
Food Chain	3	31	1	191	159	385
Flora	8	52	1	167	157	385
Fauna	7	52	2	182	142	385
Human Health	6	92	0	164	123	385
Property Damage	18	51	0	173	143	385

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	33	35	101	145	71	385
Human Health	0	15	32	181	157	385

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

Table 5-11 (cont'd) (1)

Storage Treatment Tanks

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	6	46	6	73	66	197
Food Chain	2	14	0	104	77	197
Flora	9	21	0	92	75	197
Fauna	3	24	0	95	75	197
Human Health	4	40	1	77	75	197
Property Damage	5	20	0	91	81	197

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	16	23	42	80	36	197
Human Health	2	8	14	98	75	197

Storage Treatment Piles

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	2	15	3	22	14	56
Food Chain	1	12	0	26	17	56
Flora	3	8	0	25	20	56
Fauna	2	14	0	23	17	56
Human Health	1	15	0	22	17	56
Property Damage	4	3	0	29	20	56

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	4	13	19	14	6	56
Human Health	0	3	9	23	21	56

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

Table 5-11 (cont'd)(1)

Boilers Using Waste as Fuel

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	3	2	5
Food Chain	0	0	0	3	2	5
Flora	0	0	0	3	2	5
Fauna	0	0	0	3	2	5
Human Health	0	0	0	2	3	5
Property Damage	0	0	0	3	2	5

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	0	1	3	5
Human Health	0	0	0	2	3	5

Recycling/Reclamation

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	3	21	4	33	23	84
Food Chain	1	10	0	38	35	84
Flora	1	10	0	39	34	84
Fauna	3	13	0	35	33	84
Human Health	1	27	0	30	26	84
Property Damage	2	10	0	40	32	84

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	12	17	15	23	17	84
Human Health	0	7	11	35	31	84

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

Table 5-11 (cont'd)(1)

Midnight Dump

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	6	26	1	21	30	84
Food Chain	3	12	1	30	38	84
Flora	3	17	0	26	38	84
Fauna	3	22	0	30	29	84
Human Health	3	27	0	30	24	84
Property Damage	8	23	1	31	21	84

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	7	17	16	37	7	84
Human Health	3	7	6	44	24	84

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

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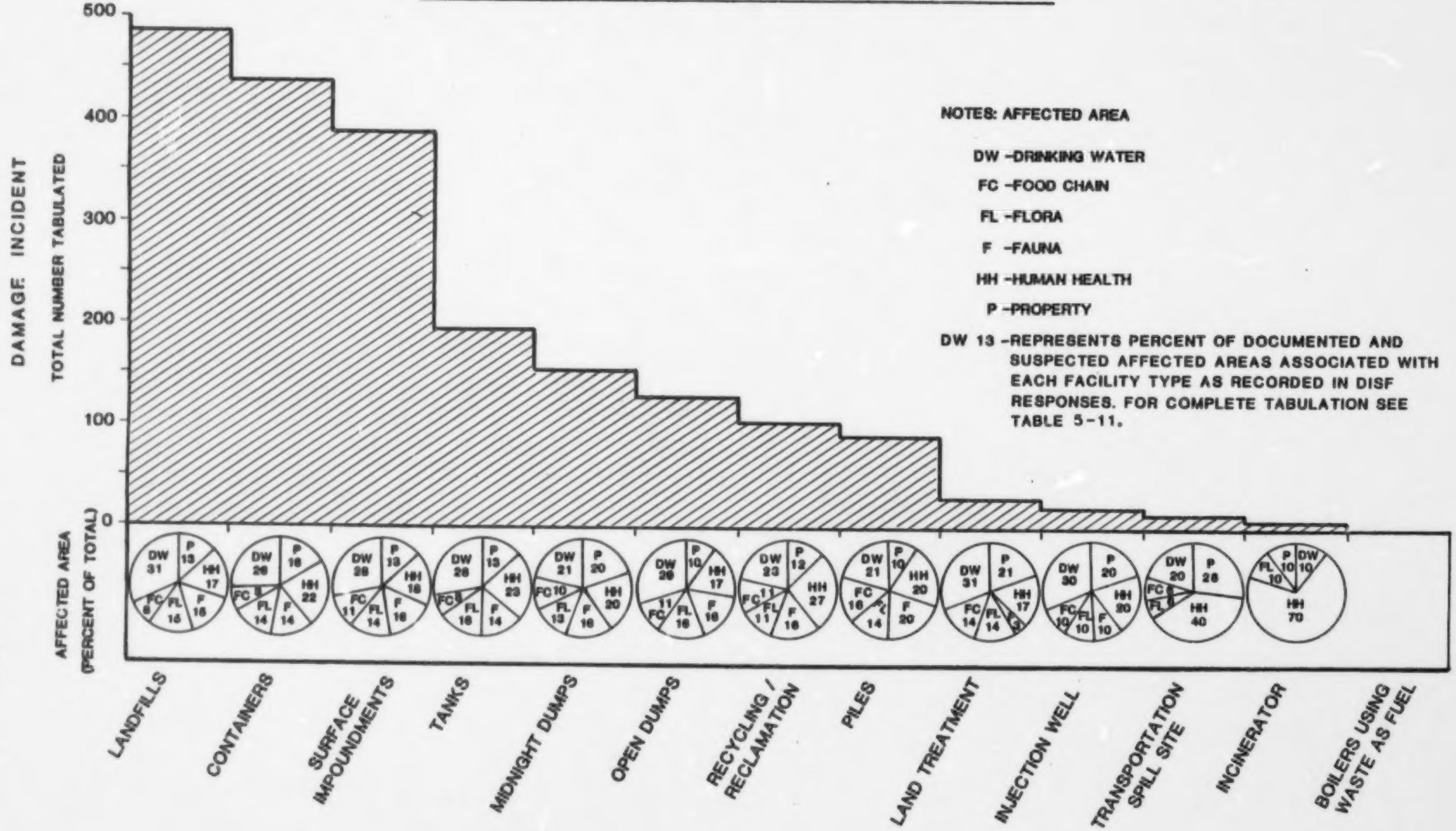
FIGURE 5-9

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES

DAMAGE TO AFFECTED AREA ASSOCIATED BY FACILITY TYPE



NOTES: AFFECTED AREA

DW -DRINKING WATER
FC -FOOD CHAIN
FL -FLORA
F -FAUNA
HH -HUMAN HEALTH
P -PROPERTY

DW 13 -REPRESENTS PERCENT OF DOCUMENTED AND SUSPECTED AFFECTED AREAS ASSOCIATED WITH EACH FACILITY TYPE AS RECORDED IN DISF RESPONSES. FOR COMPLETE TABULATION SEE TABLE 5-11.

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Table 5-12

HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

STATUS OF RESPONSE

Total Number of Sites...

...evaluated	...with legal/ enforcement action underway/completed	...with investigative actions underway/completed	...with remedial actions underway/completed
929	179	511	282

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in more detail in Sections 3.1.1 and 3.2.1.

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Remedial activities occurring at these sites included waste removal, drum excavation, leachate collection, excavation of contaminated soil, leachate control, groundwater withdrawal and treatment, neutralization, spill cleanup, containment and recovery systems, cutoff trenches, landfill development and installation of liners, as well as resident evacuation and property purchase. Expenditures for remedial activities for the sites ranged from $25,000 to $153.5 million.

6.0 Epidemiological Studies Relating to Hazardous Waste Mismanagement

6.1 Purpose

In order to gain a more accurate overall picture of the extent of health damage attributable to mismanaged wastes, a survey of state health departments was initiated. The aim of the survey was to establish the number and types of epidemiological investigations carried out in relation to hazardous waste problems. Inquiries were generally limited to departments on the state level.

6.2 Methodology

The initial contacts were the epidemiology divisions of all fifty state health departments. Appropriate personnel were queried regarding any epidemiological studies or health surveys conducted by the health department or other state agencies. When these calls resulted in referrals to other agencies (e.g. state departments of natural resources), follow-up inquiries were made. In some instances, at the agency's request, inquiries were put in writing. Copies of all pertinent studies were requested. Examples of the agencies contacted include:

- Alabama Health Department - Hazardous Materials Section,
- Colorado Health Department - Division of Radiation and Hazardous Waste,
- Delaware Department of Natural Resources,
- Illinois Environmental Protection Agency - Emergency Response Division, and
- North Carolina Health Department - Division of Epidemiology.

In order to qualify as an epidemiological study, the investigations must meet the following criteria:

- They must directly pertain to the health of human populations. Sampling of environmental media, or fish and animal tissues may provide valuable information regarding exposure levels. These measurements do not, however, in themselves, constitute an epidemiological study.
- They must measure the frequency of an effect in a group. Epidemiology is defined as "the study of the distribution and determinants of disease in humans and of the factors which influence this distribution." Thus, an epidemilogical study cannot be limited to clinical observations on one individual.

Although the studies received were not reviewed for technical merit, they were examined against the aforementioned criteria.

6.3 Results

Forty-six states responded to the survey requests, producing a total of 11 studies. Seven of these studies met the criteria in Section 6.2, i.e., they pertained directly to the measurement of health effects in human populations. Techniques utilized in these investigations generally fall into one of the following categories:

- Review of vital statistics and other mortality and morbidity data. Examples of this type of information include birth and death certificates, state cancer registries, hospital and clinic records and school and workplace absenteeism data.
- Health interview and survey questionnaire data. This method employs questionnaires that are either administered by an interviewer or filled out by the study participants. The questionnaires may cover one or more areas, including: health status (medical history, nature, frequency and duration of symptoms), and personal data (age, sex, occupation and other lifestyle factors).
- Biomonitoring. This encompasses clinical measures of health status including physical examinations; laboratory analysis of blood, urine, hair, and body fat; and lung function testing.

Table 6-1 presents a summary of the survey results by state. Descriptions of the 7 studies meeting the criteria are tabulated in Table 6-2.

6.4 Conclusions

There is some evidence that the number of studies obtained may not accurately reflect the overall extent of the health assessment work currently being performed. Several health officials cited studies presently in progress while others expressed reluctance to release data that they considered politically sensitive. In addition, the survey did not encompass work being done by universities, non-profit organizations, citizens groups and other levels of government.

Even taking these factors into account, however, the volume of epidemiological work being carried out appears to be relatively insignificant when compared against the potential number of hazardous waste mismanagement incidents. Although the survey did not specifically seek to account for the paucity of data, costs emerged as the major impediment to performing more epidemiological studies. Some health officials cited areas warranting closer examination, should funding become available.

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Table 6-1

STATUS OF EPIDEMIOLOGICAL STUDIES BY STATE

State	No Studies Available	Studies Available	Studies In Progress
Alabama	X		
Arizona	X		
Arkansas	X		
California			
Colorado	X		
Connecticut		1	
Delaware	X		
District of Columbia	X		
Florida	X		
Georgia	X		
Idaho	X		
Illinois	X		
Indiana	X		
Iowa	X		
Kansas			
Kentucky	X		
Louisiana		1	
Maine		1	
Maryland			
Massachusetts	X		
Michigan	X		
Minnesota	X		
Mississippi	X		
Missouri	X		
Montana	X		
Nebraska	X		
Nevada	X		
New Hampshire	X		
New Jersey			
New Mexico	X		
New York			
North Carolina	X		
North Dakota	X		
Ohio			
Oklahoma	X		
Oregon	X		
Pennsylvania		1	
Rhode Island	X		
South Carolina	X		
South Dakota			1
Tennessee		1	
Texas	X		
Utah	X		
Vermont	X		
Virginia		1	
Washington	X		
West Virginia	X		
Wisconsin		1	
Wyoming	X		

Table 6-2

DESCRIPTIONS OF EPIDEMIOLOGICAL INVESTIGATIONS

STATE	STUDY DESCRIPTION	TECHNIQUES UTILIZED			RESULTS
		Review of Vital Statistics	Health Survey	Bio-monitoring	
Louisiana	Health survey of Alsen community residents	X	X	X	No obvious abnormality in mortality statistics; not possible to evaluate questionnaire data; high proportion of upper respiratory and respiratory problems.
Maine	Epidemiological study of the hypothesized adverse health consequences of the Gray, Maine well-water contamination episode		X	X	No evidence of "persisting deleterious effects".
Virginia	Trichloroethylene investigation, Danville, Virginia, 1977		X	X	No TCE in blood samples; unable to determine from questionnaire data that toxic effects were apparent.
Wisconsin	Multivariate analysis of a cohort of mobile home residents exposed to formaldehyde		X		Irritant effects, swollen glands, and diarrhea were associated with log formaldehyde concentration.
Tennessee	Design of environmental health effects studies stemming from the potential for human exposure to toxic waste in Memphis, Tennessee	X	X	X	Actual study design has not yet been implemented.
Connecticut	Housatonic River PCB study: statistical analysis		X	X	PCB levels were not associated with a greater degree of symptoms. Persons eating fish from the Housatonic have (statistically) significantly higher PCB levels than those not eating the fish.
Pennsylvania	Polychlorinated biphenyl report. Old Forge, Lackawanna County		X	X	PCB serum levels of residents are similar to those found in "uncontaminated" areas. There appeared to be no medical problems which can be attributed to PCB.

Section A

APPENDIX A

DAMAGE INCIDENT SUMMARY FORM (DISF)

General Instructions

The purpose of the DISF is to provide a brief, succinct summary of each case. The DISF provides blank spaces for appropriate responses, usually an "X" marking next to information catagories (Sections I through XII). All qualifying comments and explanatory notes are to be contained in the "General Comments" narrative which is appended to the form. These comments are keyed to the form with an asterisk (*) placed at the section heading. The only exceptions to this general rule are brief phrases which specifically clarify a determination; for example, where two choices are checked, a brief note to explain this decision is required. An asterisk (*) and footnote are to be used in these cases. The form is to remain blank in cases where information is lacking, for example, where identification numbers have not been assigned, where there is no record of concern for possible contamination, or where information on quantities of generated or disposed waste is not available.

Specific Instructions

DISF Reference Numbers	Instructions
1,2,3,4,5,6	Provide site name, address and county.
7	Provide site operator's name and address. If same as 1-6 above, enter "(Same as above)". If information is not available, enter "(Not available)". If the site is a midnight dump, enter "(Not Applicable)".
8	Provide property owner's name and address if different from the operator of the site. If the realty owner and site operator are identical, enter "(Same as above)". If the information is not available enter "(Not available)". If the site is a midnight dump, enter "(Not Applicable)".
9	Provide site latitude and longitude in degrees, minutes and seconds. If the site encompasses an entire city or county, or is the site of ocean disposal, enter "(Not Applicable)".
10	Provide identification numbers, if available. Site Tracking System (STS), Notification Information Service (NOTIS), Resource Conservation and Recovery Act Identification (RCRA I.D.) and Dun &

Bradstreet (D&B) numbers are obtainable from USEPA Division of Air and Hazardous Materials Office (DAHM). Field Investigation Team (FIT) (or National Project Management Office (NPMO)) numbers are obtainable from USEPA Regional FIT teams, Deputy Project Officer. Indicate the FIT number in parentheses after the NPMO number. State ID numbers can be obtained from the respective state agency files.

11 Indicate most appropriate description of facility type. Facility types are also referred to in the DISF and accompanying report as site descriptions or categories. If a facility is composed of a variety of process types, indicate only those processes responsible for or affected by the damage incident.

- CONTAINER: A portable device in which material is stored, transported, or otherwise managed. Containers are commonly 30- or 55-gallon steel drums, although jugs, bottles, or drums of any other capacity are also considered to be containers. Additionally, tanker trucks (typically 5,000-6,000 gallon capacity) are considered to be containers in that they are mobile.

- LANDFILL FACILITY: A waste disposal site where operating practices have included the periodic application of earthen cover material over deposited wastes.

- INCINERATOR: An enclosed device in which hazardous wastes are thermally decomposed via controlled combustion procedures. Examples include rotary kilns, fluidized bed and liquid injection incinerators.

- INJECTION WELL: An excavation that is not a surface impoundment in which liquid hazardous wastes are injected for ultimate disposal.

- LAND TREATMENT FACILITY: A site where hazardous wastes are deposited on the soil surface or incorporated within the soil, for the purpose of treatment and/or disposal.

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- MIDNIGHT DUMP: A site where potentially corrosive, ignitable, reactive, or toxic wastes have been surreptitiously and illegally disposed.

- OPEN DUMP: A waste disposal site where cover material has not generally been applied.

- PILE: An accumulation of non-containerized, non-flowing solid hazardous waste.

- RECYCLING/RECLAMATION FACILITY: A facility which treats, reclaims, or otherwise recovers discarded hazardous materials for the purpose of re-use or re-sale. Typical examples are solvent and waste oil recovery operations.

- SURFACE IMPOUNDMENT: A natural basin, man-made excavation, or bermed area in which liquid hazardous wastes, or wastes containing free liquids are stored, treated, or disposed. Surface impoundments are formed primarily in earthen materials, and may or may not be equipped with synthetic liners. Examples include precipitation, aeration, and evaporation ponds and lagoons.

- TANK: A stationary, non-earthen device in which hazardous waste is stored or treated. Tanks are typically constructed of steel, aluminum, concrete or plastic, and may vary in capacity from a few hundred gallons to several million gallons. Tanks may be covered or uncovered, indoors or outdoors, and above-ground or underground.

Other categories may be added at the discretion of the reviewer. These other categories may include, for example, abandoned buildings, transfer stations, loading docks, wastewater discharges, building foundations, etc.

12 Indicate the first date of the incident or discovery of the incident. Enter only dates which can be substantiated in federal, state or local agency files. In general, these will be dates of site investigations by governmental agencies in response to citizen complaints or other reports. Where two distinct damage incidents have occurred both dates should be entered and annotated on page two, using the procedures discussed in "General Instructions".

13 Indicate status of facility (active or inactive) and the year operations began and terminated (if inactive). If damage incident was a midnight dump or spill do not complete item IV. If only a portion of site is still active, both active and inactive should be entered and annotated briefly, using procedures discussed in "General Instructions" above.

14 Indicate media exposed to contamination and whether this exposure is documented or suspected. "Contamination" is defined as the presence of pollutants in groundwater, surface water, soil or air, as identified by standard sampling and analytical techniques. Specific discussions of standard sampling techniques may be found in ASTM Standard D140-70 (extremely viscous liquids), ASTM Standard D346-75 (crushed or powdered material), ASTM Standard D420-69 (soil or rock-like material), ASTM Standard D1462-65 (soil-like material) and in "Test Methods for the Evaluation of Solid Waste, Physical/ Chemical Methods" (USEPA, Office of Solid Wastes, Washington, D.C.). Standard analytical techniques include gas chromatography, gas chromatography/mass spectroscopy, etc. as discussed in the December 3, 1979 Federal Register. A complete discussion of acceptable test methods for arsenic, barium, cadmium, chromium, lead, mercury, silver and selenium may be found in "Methods for Analysis of Water and Wastes" (Environmental Monitoring and Support Laboratory, Office of Research and Development, USEPA). Analytical procedures for endrin, lindane, methoxychlor, toxaphene, 2,4-D, and

2,4,5-TP Silvex may be found in "Methods for Benzidene Chlorinated Organic Compounds, Pentachlorophenol, and Pesticides in Water and Wastewater" (op. cit.). "Pollutants" are defined as substances not naturally found in the site-specific-environment that may interfere with the best use of, or interfere with the affected resource.

"Documented" is interpreted as information developed from monitoring and/or sampling and analytical data available from direct investigative forces, permits (e.g., NPDES, U.I.C.) engineering reports, federal or state enforcement actions (e.g., court cases, suits), etc. Contaminants are "documented", if water, soil and air sampling data indicate the presence of pollutants above detectable limits. (Detection limits may vary according to sample site, instrument sensitivity, presence of interfering contaminants, and preparation and analytical methodologies, however, in most cases, are in the parts per billion range.) "Suspected" is interpreted as information developed from newspaper articles, citizen complaints and preliminary inspections. Where no analytical data are available and there are studies and/or reports indicating that any of the respective media were not contaminated by the incident in question, so indicate. "Documented no contamination" cases are defined as those for which air, water or soil or air sampling results indicate no detectable contamination or where there appears to be low potential due to facility type or maintenance of sound management practices at the facility. In cases where preliminary site inspections revealed no apparent contamination, but sampling was nevertheless recommended, contamination is "suspected." If file data indicate that contaminants may have originated off-site, enter the appropriate numerical footnote(s) and annotation(s) on page two.

Key sampling and analytical results which support the responses in this section are to be discussed in "General Comments".

15 Indicate documented or suspected areas damaged by contamination. "Damage" is defined as the presence of pollutants that may cause interference with, loss in value of or harm to human health, drinking water, the food chain, flora, fauna, or property. Damage is to be considered as "Documented" according to the same evaluation criteria discussed in 14 above, with certain additional criteria:

- Documented damage to human health should be based on authoritative references correlating sickness, injury, or death to contamination events occuring at the facility. These references may include, but shall not be limited to, hospital reports, OSHA citations, regulatory agency reports, facility operating reports, and epidemiological studies.

- Documented damage to drinking water should be based on authoritative references correlating excessive contaminant concentration levels in the water supply with contamination events occurring at the facility. "Excessive contaminant concentrations" are defined as those constituents that exceed USEPA National Interim Primary or Secondary Drinking Water Standards or USEPA Human Health criteria for maximum contaminant levels in water supplies. Where applicable, maximum contaminant levels associated with incremental life-time cancer risks shall be evaluated relative to 10^{-6} exposed population. [The following assumptions are considered to be valid with respect to human health criteria: the exposed individual is a 70-kilogram male; the average daily consumption of estuarine and freshwater organisms is 6.5 grams; and the average daily comsumption of water is two liters. A complete discussion of the development of human health criteria may be found in the introductory sections of the November 28, 1980 Federal Register (Vol. 45, No. 231).]

- Documented damage to food chain and flora should be based on authoritative references correlating visable vegetation stress with contamination events occurring at the site.

- Documented damage to food chain or fauna should be based on authoritative references (usually bioassay studies) correlating damage to domestic animals or their products that are intended for consumption, fish or wildlife with contamination events occurring at the site.

- Documented damage to property should be based on authoritative references correlating property damage with contamination events occurring at the site. These references may include, but not be limited to, insurance claims, regulatory reports, OSHA citations, and enforcement or other legal actions. Additionally, documented damages to drinking water (e.g., restriction or closure of wells) are considered documented damage to property and should be annotated on page three with the appropriate numerical footnote.

Damage to the food chain and to fauna is interpreted as "suspected" where the contaminated site is located on or adjacent to agricultural land or to water bodies. All other evidence of potential damage is interpreted as "suspected." If there are reliable studies or reports indicating that any of these media were not contaminated by the incident in question, so indicate. If file data indicate that damage may have been caused by contaminants that originated off-site, enter the appropriate numerical footnote, and annotation (s) on page three.

Key sampling and analytical results which support the responses in this section will be discussed in "General Comments".

16 Briefly list any relevant epidemiological studies which mention documented or suspected health impacts resulting from

the incident in question. Key sampling and analytical results which support the responses in this section will be discussed in "General Comments". If there is no evidence of such studies, indicate "(Not Available)".

17 Indicate the documented or suspected event causing the incident. If more than one event is suspected, so indicate. In specific cases where there is evidence of methane generation (resulting from waste degradation), the "event-causing incident" should be indicated as "suspected fire/ explosion", and it should be noted as "potential" because of the presence of methane using the format described in "General Instructions" Similarly, where a potential hazard of flooding exists (for example, in filled lagoons) "suspected flood" should be indicated with an explanatory note. Other indicators, such as evidence of airborne particulates or unknown odors, should be listed.

18 Indicate the primary characterization of the waste (organic vs. inorganic), quantity of waste involved or potentially involved in the incident in question, and whether this information is documented or suspected. All wastes generated by the facility, including those hauled offsite, should be tabulated. "Documented" waste quantities should be based on facility records, permit applications, etc. If information on waste quantity is unavailable, that part of the form should remain blank. For waste quantities specify units (gallons, tons, drums, cubic yards, etc.). The "unknown" category will describe sites where information is lacking, for example, where waste is buried in an unknown form and in an unknown quantity. The comments section should provide brief comments related to the quantities of waste (e.g., proportions; as percentage of capacity of facility; historic rate of disposal, etc.). Specifics will be contained in the final section, "General Comments".

19 Indicate the major chemicals documented or suspected to have caused contamination of the respective media listed. Use the

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following categories: volatile halogenated organics (VHO's), non-halogenated organics (VNHO's), base neutral extractables (BNEs), pesticides, polychlorinated biphenyls (PCBs), metals, oil, ammonia/ ammonia compounds, inorganics, cyanide, acids, acid compounds, alkalies, alcohols, aldehydes, ketones, radioactive materials and asbestos. Enter parenthetically those chemicals that are found in highest concentrations or which are the major suspected contaminants. If definitive data on contaminants are not available, list general chemical groupings and indicate "suspected."

20 List principal sources of chemical analyses used to document the contamination indicated in 19 above, if available. If the information was derived from a permit, list the permit application number. If the sampling results are presented in a laboratory report, list the agency performing analytical work.

21 Indicate whether legal, remedial and/or investigative action has been undertaken in response to the incident in question. Differentiate between completed and on-going activities by circling the appropriate word. Remedial costs should be provided if available. Closure and site reclamation costs should not be included in cost estimates. If USEPA concluded that no further action was warranted, indicate this by annotating "Status of Response" and note: "Investigative Action Complete--see General Comments".

22 Provide sources of information used to complete the DISF. This information should include the file (e.g., site tracking system [STS]), reports, and/or consent orders and the title, author and date of each document. Include the file number, the regional office, the name and title of the official administrator and phone number, if available.

23 Indicate the perceived severity of environmental and human health damage as HIGH, MEDIUM, or LOW, according to the following guidelines.

- HIGH human health damage is assigned when a damage incident results in death, or when a community water supply is closed or restricted. (In the latter case also enter the appropriate numerical footnote and annotation on page five).

- MEDIUM human health damage is assigned when a damage incident results in severe injury or closure of more than one private drinking water well. (In the latter case, also enter the appropriate numerical footnote and annotation on page five).

- LOW human health damage is assigned when a damage incident results in minor injury or the closure of a single private drinking water well. (In the latter case, also enter the appropriate numerical footnote and annotation on page five).

- HIGH environmental damage is assigned when contamination of water and/or air exceeds applicable standards by ten times, when damage to food chain or flora occurs over an area greater than one acre, or when massive kills occur to fauna.

- MEDIUM environmental damage is assigned when contamination of water and/or air exceeds applicable standards, when damage to food chain or flora occurs over an area greater than one-half acre (but less than one acre), or when limited kills occur to fauna.

- LOW environmental damage is assigned when detectable contaminants do not exceed applicable standards, when damage to food chain or fauna occurs in limited areas only, when bioassay studies confirm tissue damage to fauna, or when limited soil contamination is confirmed by sampling and analytical data.

If there is reason to believe that the severity of damage may be higher than the assigned value, but information contained in the file is not sufficient to support a higher rating, enter an asterisk (*) in the right-hand margin and a footnote on page five of the DISF that refers the reader to "General Comments".

Do not make any notations in Section III if there has been no apparent damage at the site.

Discuss the rationale for the ratings in item 24 with any other pertinent comments relating to the incident in question. In most cases the rating may be determined only after a thorough review of the file is completed.

24 Indicate overall facility description, including previous and current site activity and surrounding land uses. Describe events or incidents that prompted investigation and source of pollutants. List in detail the results of significant analytical data used in support responses in Section V,VI,IX. If information is available, describe soil conditions, depth to groundwater, direction of groundwater flow, presence and proximity of potable wells, information concerning affected population, vegetation stress, property damage, etc. This data will substantiate the perceived severity of environmental and human health damage as indicated in item 23. If no detailed information exists, so state. Describe remedial measures being conducted at the site. List all recommendations provided by the investigative teams, including those of USEPA FIT, the State, local health departments, etc. Describe any record of compliance with these recommendations. The accompanying damage report Contamination and Events will be interpreted to mean both documented and suspected incidents/events unless otherwise noted.

DAMAGE INCIDENT SUMMARY FORM (DISF)

(Notes 1 thru 24 refer to
DISF instructions)

I. Site Identification
  A. Site Name (1) ____________________
  B. Street (2) ____________________
  C. City (3) ____________________
  D. State (4) ____________________
  E. Zip Code (5) ____________________
  F. County Name (6) ____________________
  G. Site Operator Information (7)
    1. Name ____________________
    2. Street ____________________
    3. City ____________________
    4. State ____________________
    5. Zip Code ____________________

  H. Realty Owner Information (8) ____________________
    1. Name ____________________
    2. Street ____________________
    3. City ____________________
    4. State ____________________
    5. Zip Code ____________________

  I. Latitude/Longitude (9) ____________________
  J. Identification Numbers (10)
    1. STS Site No. ____________________
    2. NPMO Site No. (FIT No.) ____________________

3. NOTIS No. ______________________________

4. RCRA ID. No. ______________________________

5. D & B No. ______________________________

6. State ID No. ______________________________

II. Site Description

A. Type (11)

______ Landfill Facility
______ Open Dump
______ Surface Impoundment
______ Incinerator
______ Injection Well
______ Land Treatment
______ Transportation Spill Site
______ Storage/Treatment Containers
______ Storage/Treatment Tanks
______ Storage/Treatment Piles
______ Boilers Using Waste as Fuel
______ Recycling/Reclamation
______ Midnight Dump

III. Date of Incident/Discovery (12) ______________________________

IV. Status of Operations (13)

____ Active (Year operations began: ____)

____ Inactive (Year operations began: ____) (Year of closure: ____)

V. Exposed Media (14)

	CONTAMINATION		NO CONTAMINATION
	Documented	Suspected	Documented
______ Ground Water	__________	__________	__________
______ Surface Water	__________	__________	__________
______ Air	__________	__________	__________
______ Soil	__________	__________	__________

VI. Affected Areas (15)

	DAMAGE		NO DAMAGE
	Documented	Suspected	Documented
____ Human Health	________	________	________
____ Worker	________	________	________
____ Non-worker	________	________	________
____ Drinking Water	________	________	________
____ Food Chain	________	________	________
____ Flora	________	________	________
____ Fauna	________	________	________
____ Property Damage	________	________	________

VII. Epidemiological Studies (16)

____

____

____

____

____

VIII. Event Causing Incident (17)

	Documented	Suspected
____ Fire/Explosion	________	________
____ Spill	________	________
____ Leak	________	________
____ Flood	________	________
____ Seismic Activity	________	________
____ Erosion (wind or water)	________	________
____ Leachate	________	________
____ Emission of Toxic Gases/Mists	________	________
____ Other (________________)	________	________

IX. Waste Characterization

A. Waste Types (18)

		Organic	Inorganic	Documented	Suspected	Quantity
___	Sludge (pumpable)	___	___	___	___	___
___	Solid	___	___	___	___	___
___	Liquid	___	___	___	___	___
	___ Bulk	___	___	___	___	___
	___ Containerized	___	___	___	___	___
___	Containerized Gas	___	___	___	___	___
___	Unknown	___	___	___	___	___

B. Comments ______________________________

C. Chemicals Causing Contamination (19)

	Documented	Suspected
Air		
___	___	___
___	___	___
___	___	___
___	___	___
Surface Water		
___	___	___
___	___	___
___	___	___
___	___	___
Ground Water		
___	___	___
___	___	___
___	___	___
___	___	___
Soil		
___	___	___
___	___	___
___	___	___
___	___	___

D. Source (20) ______________________________

____

____

____

X. Status of Response (21)

___ Enforcement or Other Legal Action Underway/Completed

___ Remedial Action Underway/Completed
- Remedial Cost: $ ______________

___ Investigative Action Underway

XI. Sources of Information (22)

Source	Location	Contact	Phone No.

	High	Medium	Low
XII. Severity of Damage (23)			
A. Environmental	___	___	___
B. Human Health	___	___	___

Section B.1

⑩ 102x 10'
102x

B.1 Region I Summary

B.1.1 Region I Overview. The study team evaluated and completed DISFs for 41 sites in Region I. Many of these sites contained multiple facilities. A total of 89 facility types were used in describing the sites in this region. Of the 89 facility types evaluated, 28 percent were containers, 25 percent were landfills, 11 percent were tanks and 10 percent were surface impoundments. The remaining 26 percent of the facility types were described by various other categories. As discussed in Sections 3.1 and 3.2 the reader should note for the following discussion that the data bases and the selection criteria utilized on this study limit the applicability of the conclusion reached herein to other populations of hazardous waste sites.

Contamination, either documented or suspected, was identified in all of the sites evaluated. At 35 of the sites, or 85 percent, contamination was documented. Thirty-two percent of the contamination incidents occurred to soil, with the remaining incidents occurring to groundwater (32 percent), surface water (30 percent) and air (6 percent). Of the 120 responses originally indicating contamination, only 65 (54 percent) could be documented using the evaluation criteria developed in Section 3.1.4. Each site was evaluated for damage occurring to life, property and various natural resources. This evaluation focused on six potentially affected areas, including drinking water, food chain, flora, fauna, human health and property. Damage, (either documented or suspected), was identified in at least 30 sites, or 73 percent of the sites evaluated. Of the 62 affected areas originally indicating damage, only 32 (52 percent) could be documented using the evaluation criteria. Approximately 44 percent of the documented damage incidents occurred to property, with the remaining incidents occurring to drinking water (34 percent), flora (19 percent) and human health (3 percent). There was one incident involving documented damage to human health. This incident involved a fire at a landfill reportedly making nearby residents ill. Seventy-five percent of the incidents causing the damage or contamination described above were due to leachate (37 percent), leaks (23 percent) or spills (15 percent). These incidents involved contamination caused by volatile halogenated organics, volatile nonhalogenated organics or metals in 69 percent of the incidents tabulated.

B.1.2 Sources. The study team preliminarily identified 54 files in Region I for review. File sources included 32 FIT Files, 21 S&A Files and 1 enforcement file. One file was not reviewed because the FIT team had negotiated a confidentiality agreement with the site owners. Based upon a review of the remaining 53 sites, 12 were eliminated from the study because they did not conform to the Selection Criteria summarized in Section 3.1, Table 3-1.

B.1.3 Tabulation of Site Descriptions by Facility Type. Each site was evaluated and categorized by one or more of the following fourteen site descriptions as listed in Section IIA of the DISFs.

- Landfill Facility
- Open Dump
- Surface Impoundment
- Incinerator
- Injection Well
- Land Treatment
- Transportation Spill Site
- Storage/Treatment Containers
- Storage/Treatment Tanks
- Storage/Treatment Piles
- Boilers Using Waste as Fuel
- Recycling/Reclamation
- Midnight Dump
- Other

For the 41 sites evaluated in the region, 8 of these categories were identified at least once, along with an additional 4 "other" categories not listed in the DISF. These other categories included wastewater discharges, buried sludge pits, a harbor and an auto repair shop grease pit. Table B.1-1 summarizes the total number of facility types used in describing the 41 sites evaluated. Many of these sites contained multiple facilities. A total of 89 facility types were used in describing the sites in this region. Of the 89 facility types evaluated, approximately 82 percent were identified as either containers (28 percent), landfills (25 percent), tanks (11 percent), surface impoundments (10 percent) or midnight dumps (8 percent). A total of 26 sites were described by 2 or more facility types and 14 sites by three or more facility types.

B.1.4 Contamination Incidents. Four media, i.e. groundwater, surface water, air and soil, were evaluated for site-related contamination in Section V of the DISF. In the remainder of this section, contamination will be interpreted to mean both documented and suspected incidents/ events, unless otherwise noted. Sites indicating the absence of contamination, and/or files not containing sufficient information to determine the presence of contamination, were also identified. Table B.1-2 summarizes the number of sites identified with contamination in at least one of the above media.

Contamination incidents were identified at all of the sites evaluated. A total of 120 incidents involving various media were recorded at these sites of which 65 (54 percent) could be documented by sampling and analytical data. Forty sites were identified with contamination in two or more media. For example, of the 38 sites indicating soil contamination, 35 sites also indicated groundwater contamination. File data indicated that 39 sites were contaminated from incident(s) occurring at the site evaluated. File data for the remaining 2 sites indicated that contamination may have originated off-site.

B.1.4.1 Tabulation of Media Exposed to Contamination. Table B.1-3 summarizes the total number of DISF responses indicating contamination or the absence of contamination found by media. Site files not containing sufficient information to determine contamination were also recorded for each of the media evaluated and noted, under the appropriate heading in Table B.1-3. This table indicates that 32 percent of the contamination incidents occurred to soil. The remaining incidents occurred to either groundwater (32 percent), surface water (30 percent) or air (6 percent). In many cases, contamination to more than one media occurred at any particular site.

B.1.4.2 Tabulation of Media Exposed to Contamination Incidents by Facility Type. Table B.1-4 summarizes the total number of DISF responses indicating media contamination associated with each facility type. This analysis suggests that approximately 94 percent of the sites associated with contamination incidents were identified as either landfills (31 percent), containers (28 percent), surface impoundments (14 percent), tanks (11 percent) or midnight dumps (10 percent). Table B.1-4 indicates that, for most

Table B.1-1

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITE DESCRIPTIONS BY TYPE

Facility Type	Total Number of Responses Described as Given Facility Type	Percent of Total
Landfill	22	25
Open Dump	4	5
Surface Impoundment	9	10
Incinerator	4	5
Storage/Treatment Containers	25	28
Storage/Treatment Tanks	10	11
Recycling/Reclamation	4	5
Midnight Dump	7	8
Other	4	5
Total	89	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.1-2

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES EXPOSED TO CONTAMINATION INCIDENTS

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented contamination (to at least one medium)	35	85
2	Sites indicating suspected contamination (to at least one medium) and not identified by Category 1 above	6	15
3	Sites indicating documented or suspected absence of contamination and not identified by Categories 1 and 2 above	0	0
4	Sites for which there was an absence of sufficient information in the file to make a determination of contamination, and not identified by Categories 1, 2 or 3 above	0	0
	TOTAL SITES	41	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.1-3

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT

Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
	Documented	Suspected	Documented	Suspected		
Groundwater	29	9	1	1	1	41
Surface Water	16	20	2	1	2	41
Air	1	7	1	4	28	41
Soil	19	19	0	0	3	41

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.1-4

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT BY FACILITY TYPE

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Landfill	Groundwater	7	15	0	0	0	22
	Surface Water	7	15	0	0	0	22
	Air	0	5	0	1	16	22
	Soil	3	17	0	0	2	22
Open Dump	Groundwater	1	3	0	0	0	4
	Surface Water	0	4	0	0	0	4
	Air	0	0	0	0	4	4
	Soil	0	4	0	0	0	4
Surface Impoundment	Groundwater	3	6	0	0	0	9
	Surface Water	2	7	0	0	0	9
	Air	0	3	0	0	6	9
	Soil	2	7	0	0	0	9
Incinerator	Groundwater	0	0	0	4	0	4
	Surface Water	0	0	0	4	0	4
	Air	0	1	0	0	3	4
	Soil	0	0	0	4	0	4

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.1-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Injection(2) Well	Groundwater						
	Surface Water						
	Air						
	Soil						
Land Treatment(2)	Groundwater						
	Surface Water						
	Air						
	Soil						
Transportation Spill Site(2)	Groundwater						
	Surface Water						
	Air						
	Soil						
Storage Treatment Containers	Groundwater	3	17	2	2	1	25
	Surface Water	2	16	3	2	2	25
	Air	0	5	0	1	19	25
	Soil	5	16	1	2	1	25
Storage Treatment Tanks	Groundwater	1	7	0	1	1	10
	Surface Water	0	7	1	1	1	10
	Air	0	2	0	4	4	10
	Soil	1	6	0	1	2	10

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.
(2) Facility type not identified in files evaluated.

Table B.1-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Storage Treatment Piles(2)	Groundwater						
	Surface Water						
	Air						
	Soil						
Boilers Using Waste as Fuel(2)	Groundwater						
	Surface Water						
	Air						
	Soil						
Recycling Reclamation	Groundwater	0	2	0	0	2	4
	Surface Water	0	2	0	0	2	4
	Air	0	0	0	2	2	4
	Soil	0	1	0	0	3	4
Midnight Dump	Groundwater	1	6	0	0	0	7
	Surface Water	0	5	0	1	1	7
	Air	0	1	0	1	5	7
	Soil	0	7	0	0	0	7

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

containers (28 percent), surface impoundments (14 percent), tanks (11 percent) or midnight dumps (10 percent). Table B.1-4 indicates that, for most of the incidents tabulated, in decreasing order of occurrence, contamination to:

- groundwater was associated with landfills, containers, surface impoundments, and tanks;
- surface water was associated with landfills, containers, surface impoundments, and tanks;
- soil was associated with containers, landfills, surface impoundments, and tanks; and
- air was associated with containers, landfills, surface impoundments, and tanks.

B.1.5 Events Causing Contamination. Contaminated sites were associated with one or more of the following events, as outlined in Section VIII of the DISF.

- Fire/Explosion
- Spill
- Leak
- Flood
- Seismic Activity
- Erosion
- Leachate
- Emission of Toxic Gases/Mists

In the remainder of this section, events tabulated will include both documented and suspected events, unless otherwise noted.

Seven of the above events were identified at least once, along with one other type not listed in the DISF. This other event was described as a wastewater discharge. A total of 13 sites (32 percent) were involved in two events and 14 sites (34 percent) in three or more events.

B.1.5.1 Tabulation of Events Causing Contamination Incidents. Table B.1-5 summarizes the total number of events causing contamination incidents. In total, 81 contamination events involving various facility types were recorded in the DISFs. For this region, this tabulation indicates that approximately 75 percent of the contamination events were related to leachate (37 percent), leaks (23 percent) or spills (15 percent). Of the 81 contamination events tabulated, 36 (44 percent) could be documented from information available in the file.

B.1.5.2 Tabulation of Events Causing Contamination Incidents By Facility Type. Table B.1-6 summarizes the events causing contamination incidents at various facility types. Since a number of sites contained a multiple number of facilities, there were a number of cases where there was insufficient information available in the file to identify the damage incident with the specific facility unit in question. These represented approximately 17 percent of the total and are identified in Table B.1-6.

This analysis indicates that approximately 80 percent of the leachate events were associated with landfills (40 percent), containers (27 percent) or surface impoundments (13 percent). Leaks were found to occur primarily at container storage facilities (43 percent), landfills (23 percent) and tanks (14 percent). Approximately 77 percent of the spill events were

Table B.1-5

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS

Event	Documented	Suspected	Total
Fire/Explosion	7	1	8
Spills	4	8	12
Leaks	1	18	19
Flood	0	1	1
Seismic Activity	0	0	0
Erosion	2	0	2
Leachate	19	11	30
Emission of Toxic Gases/Mists	2	5	7
Other	1	1	2
Total	36	45	81

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.1-6

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS BY FACILITY TYPE

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Landfill	Fire/Explosion	1	1	0	2
	Spills	0	6	0	6
	Leaks	0	8	0	8
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	1	0	0	0
	Leachate	6	16	0	22
	Emission of Toxic Gases/Mists	1	3	0	4
	Other	0	0	0	0
Open Dump	Fire/Explosion	0	0	0	0
	Spills	0	1	0	1
	Leaks	0	1	0	1
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	2	0	3
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Surface Impoundments	Fire/Explosion	1	0	0	1
	Spills	0	1	2	3
	Leaks	0	2	1	3
	Flood	0	1	0	1
	Seismic Activity	0	0	0	0
	Erosion	1	0	0	1
	Leachate	2	5	0	7
	Emission of Toxic Gases/Mists	0	2	1	3
	Other	0	0	0	0

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.1-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Incinerator	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	4	4
	Other	0	0	0	0
Injection Well(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				
Land Treatment(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				
Transportation Spill Site(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

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Table B.1-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Storage Treatment Containers	Fire/Explosion	2	2	1	5
	Spills	1	4	2	7
	Leaks	2	13	2	17
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	15	2	17
	Emission of Toxic Gases/Mists	0	3	1	4
	Other	0	0	0	0
Storage Treatment Tanks	Fire/Explosion	0	1	1	2
	Spills	0	2	2	4
	Leaks	0	5	3	8
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	5	0	5
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	0	0	0	0
Storage Treatment Piles(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				
Boilers Using Waste as Fuel(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.1-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Recycling Reclamation	Fire/Explosion	0	1	0	1
	Spills	0	1	2	3
	Leaks	0	0	2	2
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	1	1	2
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Midnight Dump	Fire/Explosion	1	1	0	2
	Spills	0	1	0	1
	Leaks	0	4	0	4
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	4	0	4
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	0	1	0	1

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

associated with storage or treatment facilities (all types) (42 percent) and landfills (35 percent). Air pollution events, i.e., emissions of toxic gases and mists, were most commonly associated with landfills (36 percent) and containers (27 percent). Facilities having the highest frequency of fires and explosions were containers (36 percent) and landfills and midnight dumps (each 18 percent).

B.1.6 Chemicals Documented in Contamination Incidents. For this analysis, chemical compounds were organized into the following general categories:

- Volatile Halogenated Organics (VHOs)
- Volatile Non-halogenated Organics (VNHOs)
- Base Neutral Extractables (BNEs)
- Pesticides
- PCBs
- Metals
- Oil
- Ammonia/Ammonia Compounds
- Asbestos
- Inorganics
- Cyanide
- Acids
- Acid Compounds
- Alkalies
- Alcohols
- Aldehydes
- Ketones
- Radioactive

Table B.1-7 summarizes the total number of times that a chemical in a given category was positively identified by sampling and analytical techniques as occurring as contaminants in the various media.

Twelve of these chemical categories were identified at least once, along with two additional categories not listed above. These other categories included greases and esters. This tabulation indicates that approximately 69 percent of the chemical categories were identified as either VHOs (31 percent), VNHOs (23 percent) or metals (15 percent). Table B.1-8 lists the most commonly occurring chemicals found in each of these categories, and the range of concentrations observed in the affected media.

B.1.7 Damage Incidents. The following six affected areas were evaluated for site related damage on the DISF.

- Drinking Water
- Food Chain
- Flora
- Fauna
- Human Health
- Property Damage

In the remainder of this section damage will be interpreted to mean both documented and suspected incidents/events unless otherwise noted.

Damage was identified for at least 30 sites, or 73 percent, of the sites evaluated. As noted in Section B.1.4 all of the sites indicated contamination. Damage was indicated in approximately 73 percent of the contaminated sites evaluated. Of the 62 affected areas indicating damage only 32 (52 percent) could be documented using the evaluation criteria.

Sites indicating the absence of damage, and/or files not containing sufficient information to determine damage, were also identified. A tabulation of sites identified with damage for at least one of the above categories is outlined in Table B.1-9. Of note, are the 18 sites (44 percent)

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Table B.1-7

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF CHEMICALS DOCUMENTED IN CONTAMINATION INCIDENTS

Chemical Category	Total Positive Identifications	Percent of Total
Volatile Halogenated Organics (VHOs)	29	31
Volatile Non-halogenated Organics (VNHOs)	22	23
Base Neutral Extractables (BNEs)	10	11
Pesticides	1	1
PCBs	4	4
Metals	14	15
Oil	1	1
Ammonia/Ammonia Compounds	1	1
Inorganics	0	0
Cyanide	1	1
Acids	0	0
Acid Compounds	2	2
Alkalies	0	0
Alcohols	1	1
Aldehydes	0	0
Ketones	6	6
Radioactive	0	0
Asbestos	0	0
Others	2	2
Total	94	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.1-8

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

CONCENTRATION OF SELECTED CONTAMINANTS IDENTIFIED BY MEDIA

Most Frequently Observed Chemical Category	Contaminant	Contaminant Concentration Range			
		Groundwater (mg/l)	Surface Water (mg/l)	Soil (mg/kg)	Air (mg/l)
VHOs	1,1,1 trichloroethane	0.003- 2.68	0.009- 1.60	0.080- 1.37	ND
	trichloroethylene	0.011- 43.0	0.004- 0.840	trace- 0.10	ND
	dichloromethane	0.230- 19.0	trace- 7.70	ND	ND
VNHOs	benzene	0.009- 6.00	0.004-22.0	ND	ND
	toluene	0.0064-29.0	0.001- 2.40	0.78- 3.54	ND
	xylene	0.020- 18.8	0.040- 1.70	ND	ND
Metals	lead	0.034- 8.1	trace- 0.16	trace- 0.630	ND
	manganese	0.39- 120	trace- 0.24	ND	ND
	chromium	0.140- 0.334	ND	0.110-960	ND

NOTES:

ND = no data available

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.1-9

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES DAMAGED

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented damage (to at least one affected area)	19	46
2	Sites indicating suspected damage (to at least one affected area) and not identified by Category 1 above	11	27
3	Sites indicating documented or suspected absence of damage and not identified by Categories 1 and 2 above	1	2
4	Sites for which there was an absence of sufficient information in the file to make a determination of damage and not identified by Categories 1,2 and 3 above	10	24
	TOTAL SITES	41	100

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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identified as having damage to two or more affected areas. Of the 38 sites indicating soil contamination, 17 sites also indicated damage to drinking water. Also, of the 41 sites indicating soil and/or surface water contamination, 10 sites also indicated damage to flora, fauna or the food chain.

B.1.7.1 Tabulation of Number, Type and Severity of Damage Incidents. Table B.1-10 summarizes the total number of DISF responses indicating damage to the above affected areas. Site files not containing sufficient information to determine damage were also recorded and noted under the appropriate heading in Table B.1-10.

Table B.1-10 indicates that 43 percent of the documented damage incidents occurred to property, with the remaining incidents occurring to drinking water (33 percent), flora (20 percent) and human health (3 percent).

Table B.1-10 indicates that of the 41 sites evaluated, 24 sites (58 percent) indicated high environmental damage, 4 sites (10 percent) indicated medium environmental damage and 6 sites (15 percent) indicated low environmental damage. The remaining 7 site files indicated no apparent damage (5 percent) or did not have enough information available (12 percent) to make an evaluation. Of note, are the files associated with the 9 sites (22 percent) which suggested that the actual damage may be higher than the response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

The analysis also indicated that out of the 41 sites evaluated, no site indicated high human health damage, 8 sites (20 percent) indicated medium human health damage and 3 sites (7 percent) indicated low human health damage. The remaining 30 sites indicated no apparent damage (i.e., there was no data available on public health damages) (39 percent) or while there was some data there was not enough information available to make an evaluation (34 percent). Of note, are the files associated with 17 sites (41 percent) which suggested that the actual human health damage may be higher than the severity response described in the DISF, but the files contained insufficient analytical data available to support a higher damage rating.

B.1.7.2 Tabulation of Number and Severity of Damage Incidents by Facility Type. Table B.1-11 summarizes the DISF responses indicating damage to each affected area by associated facility type. This analysis indicates that approximately 82 percent of the damage incidents were associated with storage facilities (42 percent), landfills (28 percent) or surface impoundments (12 percent). The remaining 18 percent of the damage incidents were associated with open dumps, incinerators, recycling/reclamation, and midnight dumps.

Table B.1-11 also indicates that 80 percent of the incidents involving damage to drinking water involved containers and tanks (39 percent) , landfills (28 percent) and surface impoundments (13 percent). Table B.1-11 also identifies the severity of damage to environment and/or human health. Landfills, storage facilities and surface impoundments resulted in 88 percent of the cases involving high or medium environmental damage and 33 percent of the cases involving high or medium human health damage.

Table B.1-10

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[1]

TABULATION OF NUMBER & SEVERITY OF DAMAGE INCIDENTS

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	11	8	3	7	12	41
Food Chain	0	1	0	7	33	41
Flora	6	2	0	4	29	41
Fauna	0	2	0	7	32	41
Human Health	1	14	0	18	8	41
Property Damage	14	3	0	8	16	41

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	24	4	6	5	2	41
Human Health	0	8	3	14	16	41

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[1] Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.1-11

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY DAMAGE INCIDENTS BY FACILITY TYPE

Landfill

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	11	1	1	9	22
Food Chain	0	1	0	2	19	22
Flora	1	3	0	2	16	22
Fauna	0	1	0	1	20	22
Human Health	1	7	0	8	6	22
Property Damage	0	9	0	2	11	22

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	7	0	1	14	0	22
Human Health	0	0	0	16	6	22

Open Dump

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	1	1	0	0	2	4
Food Chain	0	0	0	0	4	4
Flora	0	1	0	1	2	4
Fauna	0	0	0	0	4	4
Human Health	0	2	0	1	1	4
Property Damage	1	1	0	1	1	4

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	0	3	0	4
Human Health	0	1	0	2	1	4

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.1-11 (cont'd)(1)

Surface Impoundments

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	5	1	0	3	9
Food Chain	0	0	0	0	9	9
Flora	0	3	0	0	6	9
Fauna	0	1	0	0	8	9
Human Health	0	3	0	4	2	9
Property Damage	0	2	0	0	7	9

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	1	0	6	0	9
Human Health	0	0	0	6	3	9

Incinerator

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	4	0	4
Food Chain	0	0	0	0	4	4
Flora	0	0	0	0	4	4
Fauna	0	0	0	0	4	4
Human Health	0	0	0	0	4	4
Property Damage	0	0	0	0	4	4

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	4	0	4
Human Health	0	0	0	4	0	4

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.1-11 (cont'd)(1)

Injection Well(2)

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

Land Treatment(2)

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.1-11 (cont'd)(1)

Transportation Spill Site(2)

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

Storage Treatment Containers

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	1	11	1	6	6	25
Food Chain	0	1	0	6	18	25
Flora	1	5	0	5	14	25
Fauna	0	0	0	6	19	25
Human Health	0	9	0	10	6	25
Property Damage	2	9	0	6	8	25

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	3	0	2	17	3	25
Human Health	0	1	0	17	7	25

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

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Table B.1-11 (cont'd)(1)

Storage Treatment Tanks

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	3	1	4	2	10
Food Chain	0	0	0	3	7	10
Flora	0	2	0	2	6	10
Fauna	0	0	0	3	7	10
Human Health	0	4	0	4	2	10
Property Damage	2	3	0	2	3	10

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	0	8	1	10
Human Health	0	0	0	8	2	10

Storage Treatment Piles(2)

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

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Table B.1-11 (cont'd)(1)

Boilers Using Waste as Fuel(2)

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

Recycling/Reclamation

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	2	1	0	1	4
Food Chain	0	0	0	0	4	4
Flora	0	0	0	0	4	4
Fauna	0	0	0	0	4	4
Human Health	0	2	0	1	1	4
Property Damage	0	2	0	0	2	4

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	4	0	4
Human Health	0	0	0	3	1	4

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.1-11 (cont'd)(1)

Midnight Dump

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	1	3	0	0	3	7
Food Chain	0	0	0	0	7	7
Flora	0	1	0	1	5	7
Fauna	0	0	0	0	7	7
Human Health	0	4	0	3	0	7
Property Damage	1	3	0	3	0	7

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	0	6	0	7
Human Health	0	1	0	5	2	7

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

B.1.8 Status of Response. Table B.1-12 summarizes the status of each site evaluated from the standpoint of enforcement, investigative and remedial activites. This table indicates that only 22 percent of the files evaluated indicated that the sites identified were involved in either past or present legal or enforcement actions. However, 33 (80 percent) site files indicated that additional environmental investigations were in progress or completed. Fifteen (37 percent) sites were reported to be involved with past or present remedial activities.

Table B.1-12 also compares the damage incident type with the remedial activities and related costs for sites having cost data available. These activities included removal of wastes and groundwater withdrawal and treatment. Available data on expenditures for remedial activities for the sites ranged from \$500,000 to \$570,000.

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Table B.1-12

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[1]

STATUS OF RESPONSE

Total Number of Sites...			
...evaluated	...with legal/ enforcement action underway/completed	...with investigative actions underway/completed	...with remedial actions underway/completed
41	9	33	15

DESCRIPTION OF REMEDIAL ACTIVITY

Damage Incident	Facility type	Location	Remedial Activity	Costs ($)
1. Leaks	SI	Burnville, RI	Removal of wastes	500,000
2. Leachate	SI, I, STC	Smithfield, RI	Removal of drums, withdrawal of groundwater and treatment of contaminated water	570,000

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Section B.2

B.2 Region II Summary

B.2.1 Region II Overview. The study team evaluated and completed DISFs for 214 sites in Region II. Many of these sites contained multiple facilities. A total of 380 facility types were used in describing the sites in this region. Of the 380 facility types evaluated, 35 percent were landfills, 22 percent were containers, 13 percent were surface impoundments and 7 percent were tanks. The remaining 23 percent of the facility types were described by various other categories. As discussed in Sections 3.1 and 3.2, the reader should note for the following discussion that the data bases and the selection criteria utilized on this study limit the applicability of the conclusions reached herein to other populations of hazardous waste sites.

Contamination, either documented or suspected, was identified in at least 199 sites, or 93 percent of the sites evaluated. At 121 of the sites, or 57 percent, contamination was documented. Thirty-three percent of the contamination incidents occurred to groundwater, with the remaining incidents occurring to soil (28 percent), surface water (28 percent) and air (11 percent). Of the 480 responses originally indicating contamination, only 173 (36 percent) could be documented using the evaluation criteria developed in Section 3.1.4. Each site was evaluated for damage occurring to life, property, and various natural resources. This evaluation focused on six potentially affected areas, including drinking water, food chain, flora, fauna, human health and property. Damage, (either documented or suspected), was identified in at least 137 sites, or 64 percent of the sites evaluated. Of the 286 affected areas originally indicating damage, only 93 (32 percent) could be documented using the evaluation criteria. Approximately 36 percent of the documented damage incidents occurred to property, with the remaining incidents occurring to drinking water (28 percent), flora (18 percent), human health (7 percent), fauna and food chain (11 percent). There were 7 incidents involving documented damage to human health. Seventy-eight percent of the incidents causing the damage or contamination described above were due to leachate (42 percent), leaks (23 percent) or spills (13 percent). These incidents involved contamination caused by volatile halogenated organics, volatile nonhalogenated organics or metals in 55 percent of the incidents tabulated.

B.2.2 Sources. The study team preliminarily identified 253 files in Region II for review. File sources included 125 FIT Files and 128 S&A Files. Based upon a review of the 253 sites, 39 were eliminated from the study because they did not conform to the Selection Criteria summarized in Section 3.1, Table 3-1.

B.2.3 Tabulation of Site Descriptions by Facility Type. Each site was evaluated and categorized by one or more of the following fourteen site descriptions as listed in Section IIA of the DISFs.

- Landfill Facility
- Open Dump
- Surface Impoundment
- Incinerator
- Injection Well
- Land Treatment
- Transportation Spill Site
- Storage/Treatment Containers
- Storage/Treatment Tanks
- Storage/Treatment Piles
- Boilers Using Waste as Fuel
- Recycling/Reclamation
- Midnight Dump
- Other

identified at least once, along with an additional 3 "other" categories not listed in the DISF. These other categories included wastewater discharge, chemical/physical treatment, and well field. Table B.2-1 summarizes the total number of facility types used in describing the 214 sites evaluated. Many of these sites contained multiple facilities. A total of 380 facility types were used in describing the sites in this region. Of the 380 facility types evaluated, approximately 83 percent were identified as either landfills (35 percent), containers (22 percent), surface impoundments (13 percent), tanks (7 percent), or midnight dumps (6 percent). A total of 112 sites were described by 2 or more facility types and 37 sites by three or more facility types.

B.2.4 Contamination Incidents. Four media, i.e. groundwater, surface water, air and soil, were evaluated for site-related contamination in Section V of the DISF. In the remainder of this section, contamination will be interpreted to mean both documented and suspected incidents/events, unless otherwise noted. Sites indicating the absence of contamination, and/or files not containing sufficient information to determine the presence of contamination, were also identified. Table B.2-2 summarizes the number of sites identified with contamination in at least one of the above media.

Contamination incidents were identified in at least 199 sites, or 93 percent of the sites evaluated. A total of 480 incidents involving various media were recorded at these sites of which 173 (36 percent) could be documented by sampling and analytical data. One-hundred and sixty-two sites were identified with contamination in two or more media. For example, of the 133 sites indicating soil contamination, 108 sites also indicated groundwater contamination. File data indicated that 191 sites were contaminated from incident(s) occurring at the site evaluated. File data for the remaining eight sites indicated that contamination may have originated off-site.

B.2.4.1 Tabulation of Media Exposed to Contamination. Table B.2-2 summarizes the total number of DISF responses indicating contamination or the absence of contamination found by media. Site files not containing sufficient information to determine contamination were also recorded for each of the media evaluated and noted under the appropriate heading in Table B.2-3 This table indicates that 33 percent of the contamination incidents occurred to groundwater. The remaining incidents occurred to either soil (28 percent), surface water (28 percent) or air (11 percent). In many cases, contamination to more than one media occurred at any particular site.

B.2.4.2 Tabulation of Media Exposed to Contamination Incidents by Facility Type. Table B.2-4 summarizes the total number of DISF responses indicating media contamination associated with each facility type. This analysis suggests that approximately 87 percent of the sites associated with contamination incidents were identified as either landfills (34 percent), containers (23 percent), surface impoundments (15 percent), tanks (8 percent) or midnight dumps (7 percent). Table B.2-4 indicates that, for most of the incidents tabulated, in decreasing order of occurrence, contamination to:

Table B.2-1

USEPA REGION II
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITE DESCRIPTIONS BY TYPE

Facility Type	Total Number of Responses Described as Given Facility Type	Percent of Total
Landfill	131	35
Open Dump	20	5
Surface Impoundment	50	13
Incinerator	7	2
Injection Well	1	0
Land Treatment	1	0
Transportation Spill Site	2	1
Storage/Treatment Containers	82	22
Storage/Treatment Tanks	25	7
Storage/Treatment Pile	7	2
Boilers Using Waste as Fuel	3	1
Recycling/Reclamation	12	3
Midnight Dump	23	6
Wastewater Discharge	13	3
Other	3	1
Total	380	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.2-2

USEPA REGION II
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES EXPOSED TO CONTAMINATION INCIDENTS

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented contamination (to at least one medium)	121	57
2	Sites indicating suspected contamination (to at least one medium) and not identified by Category 1 above	78	36
3	Sites indicating documented or suspected absence of contamination and not identified by Categories 1 and 2 above	12	6
4	Sites for which there was an absence of sufficient information in the file to make a determination of contamination, and not identified by Categories 1, 2 or 3 above	3	1
	TOTAL SITES	214	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-3

USEPA REGION II
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT

Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
	Documented	Suspected	Documented	Suspected		
Groundwater	76	83	9	15	31	214
Surface Water	36	101	3	22	52	214
Air	12	39	0	79	84	214
Soil	49	84	1	22	58	214

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-4

USEPA REGION II
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT BY FACILITY TYPE

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Landfill	Groundwater	29	71	5	9	17	131
	Surface Water	15	67	1	14	34	131
	Air	6	19	0	46	60	131
	Soil	14	59	0	13	45	131
Open Dump	Groundwater	1	12	0	3	4	20
	Surface Water	0	11	0	2	7	20
	Air	1	3	0	6	10	20
	Soil	3	11	0	1	5	20
Surface Impoundment	Groundwater	8	30	3	4	5	50
	Surface Water	6	29	1	5	9	50
	Air	0	10	0	21	19	50
	Soil	9	30	0	5	6	50
Incinerator	Groundwater	0	0	1	6	0	7
	Surface Water	0	0	0	6	1	7
	Air	1	4	0	0	2	7
	Soil	0	0	1	6	0	7

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Injection Well	Groundwater					1	1
	Surface Water					1	1
	Air					1	1
	Soil					1	1
Land Treatment	Groundwater	0	0	0	0	1	1
	Surface Water	0	1	0	0	0	1
	Air	0	1	0	0	0	1
	Soil	0	1	0	0	0	1
Transportation Spill Site	Groundwater	0	1	0	1	0	2
	Surface Water	0	1	0	1	0	2
	Air	0	0	0	1	1	2
	Soil	0	1	0	1	0	2
Storage Treatment Containers	Groundwater	4	52	2	8	16	82
	Surface Water	3	46	0	10	23	82
	Air	1	20	0	26	35	82
	Soil	6	55	0	5	16	82
Storage Treatment Tanks	Groundwater	1	15	1	5	3	25
	Surface Water	2	16	0	5	2	25
	Air	0	12	0	9	4	25
	Soil	3	16	0	4	2	25

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.2-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Storage Treatment Piles	Groundwater	1	3	0	1	2	7
	Surface Water	0	4	0	1	2	7
	Air	0	4	0	2	1	7
	Soil	0	4	0	1	2	7
Boilers Using Waste as Fuel	Groundwater	0	0	0	1	2	3
	Surface Water	0	0	0	1	2	3
	Air	1	0	0	1	1	3
	Soil	0	0	0	1	2	3
Recycling/ Reclamation	Groundwater	1	6	0	3	2	12
	Surface Water	0	5	0	2	5	12
	Air	0	4	0	5	3	12
	Soil	0	6	0	3	3	12
Midnight Dump	Groundwater	2	16	0	0	5	23
	Surface Water	0	19	0	0	4	23
	Air	0	5	0	5	13	23
	Soil	1	16	0	0	6	23
Wastewater Discharge	Groundwater	2	5	0	1	5	13
	Surface Water	2	6	0	1	4	13
	Air	0	0	0	10	3	13
	Soil	3	5	0	3	2	13

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

- groundwater was associated with landfills, surface impoundment, containers, tanks, and midnight dumps;
- surface water was associated with landfills, surface impoundments, containers, tanks, and midnight dumps;
- soil was associated with landfills, surface impoundments, containers, tanks, midnight dumps; and
- air was associated with landfills, surface impoundments, containers, tanks, midnight dump, and incinerators.

B.2.5 Events Causing Contamination. Contaminated sites were associated with one or more of the following events, as outlined in Section VIII of the DISF.

- Fire/Explosion
- Spill
- Leak
- Flood
- Seismic Activity
- Erosion
- Leachate
- Emission of Toxic Gases/Mists

In the remainder of this section, events tabulated will include both documented and suspected events, unless otherwise noted.

Seven of these events were identified at least once, along with one other type not listed in the DISF. This other event was described as wastewater discharge. A total of 91 sites (43 percent) were involved in two events and 31 sites (14 percent) in three or more events.

B.2.5.1 Tabulation of Events Causing Contamination Incidents. Table B.2-5 summarizes the total number of events causing contamination incidents. In total, 360 contamination events involving various facility types were recorded in the DISFs. For this region, this tabulation indicates that approximately 78 percent of the contamination events were related to leachate (42 percent), leaks (23 percent) or spills (13 percent). Of the 360 contamination events tabulated, 177 (49 percent) could be documented from information available in the file.

B.2.5.2 Tabulation of Events Causing Contamination Incidents By Facility Type. Table B.2-6 summarizes the events causing contamination incidents at various facility types. Since a number of sites contained a multiple number of facilities, there were a number of cases where there was insufficient information available in the file to identify the damage incident with the specific facility unit in question. These represented approximately 1 percent of the total and are identified in Table B.2-6.

This analysis indicates that approximately 80 percent of the leachate events were associated with landfills (48 percent), containers (18 percent) or surface impoundments (14 percent). Leaks were found to occur primarily at surface impoundment and container and tanks storage facilities. Approximately 66 percent of the spill events were associated with storage or treatment facilities (all types) (41 percent) and surface impoundments (25 percent). Air pollution events, i.e., emissions of toxic gases and mists, were most commonly associated with landfills (40 percent) and storage con-

Table B.2-5

USEPA REGION II
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS

Event	Documented	Suspected	Total
Fire/Explosion	10	3	13
Spills	26	22	48
Leaks	30	51	81
Flood	3	4	7
Seismic Activity	0	0	0
Erosion	12	1	13
Leachate	77	73	150
Emission of Toxic Gases/Mists	13	24	37
Other	6	5	11
Total	177	183	360

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-6

USEPA REGION II
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS BY FACILITY TYPE

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Landfill	Fire/Explosion	2	2	0	4
	Spills	2	4	0	6
	Leaks	1	9	1	11
	Flood	0	2	0	2
	Seismic Activity	0	0	0	0
	Erosion	7	1	0	8
	Leachate	50	56	1	107
	Emission of Toxic Gases/Mists	7	18	0	25
	Other	1	1	0	2
Open Dump	Fire/Explosion	2	1	0	3
	Spills	2	3	0	5
	Leaks	1	6	0	7
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	9	0	10
	Emission of Toxic Gases/Mists	1	2	0	3
	Other	0	1	0	1
Surface Impoundments	Fire/Explosion	0	0	0	0
	Spills	1	2	0	3
	Leaks	1	23	0	24
	Flood	2	1	0	3
	Seismic Activity	0	0	0	0
	Erosion	1	0	0	1
	Leachate	5	26	0	31
	Emission of Toxic Gases/Mists	0	6	0	6
	Other	1	0	0	1

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-6 (cont'd)[1]

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Incinerator	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	2	4	0	6
	Other	0	0	0	0
Injection Well	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	1	0	1
Land Treatment[2]	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Transportation Spill Site	Fire/Explosion	0	0	0	0
	Spills	2	0	0	2
	Leaks	2	0	0	2
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	0	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.2-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Storage Treatment Containers	Fire/Explosion	2	1	0	3
	Spills	6	20	0	26
	Leaks	9	43	2	54
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	5	36	0	41
	Emission of Toxic Gases/Mists	1	10	0	11
	Other	0	1	0	1
Storage Treatment Tanks	Fire/Explosion	0	1	0	1
	Spills	6	7	0	13
	Leaks	4	10	0	14
	Flood	0	2	0	2
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	9	0	10
	Emission of Toxic Gases/Mists	0	5	0	5
	Other	0	0	0	0
Storage Treatment Piles	Fire/Explosion	1	0	0	1
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	2	0	3
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	0	0	0	0
Boilers Using Waste as Fuel	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	1	0	0	1
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Recycling Reclamation	Fire/Explosion	0	0	0	0
	Spills	1	3	0	4
	Leaks	0	2	0	2
	Flood	0	1	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	1	0	2
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	0	0	0	0
Midnight Dump	Fire/Explosion	0	0	0	0
	Spills	1	6	0	7
	Leaks	0	10	0	10
	Flood	1	0	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	4	11	0	15
	Emission of Toxic Gases/Mists	0	4	0	4
	Other	0	0	0	0
Wastewater Discharge	Fire/Explosion	0	0	0	0
	Spills	0	1	0	1
	Leaks	0	1	0	1
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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tainers (17 percent). Facilities having the highest frequency of fires and explosions were landfills (31 percent), containers (23 percent), and open dumps (23 percent).

B.2.6 Chemicals Documented in Contamination Incidents. For this analysis, chemical compounds were organized into the following general categories:

- Volatile Halogenated Organics (VHOs)
- Volatile Non-halogenated Organics (VNHOs)
- Base Neutral Extractables (BNEs)
- Pesticides
- PCBs
- Metals
- Oil
- Ammonia/Ammonia Compounds
- Asbestos
- Inorganics
- Cyanide
- Acids
- Acid Compounds
- Alkalies
- Alcohols
- Aldehydes
- Ketones
- Radioactive

Table B.2-7 summarizes the total number of times that a chemical in a given category was positively identified by sampling and analytical techniques as occurring as contaminants in the various media.

Sixteen of these chemical categories were identified at least once. This tabulation indicates that approximately 54 percent of the chemical categories were identified as either metals (21 percent), VHOs (19 percent), or VNHOs (15 percent). Table B.2-8 lists the most commonly occurring chemicals found in each of these categories, and the range of concentrations observed in the affected media.

B.2.7 Damage Incidents. The following six affected areas were evaluated for site related damage on the DISF.

- Drinking Water
- Food Chain
- Flora
- Fauna
- Human Health
- Property Damage

In the remainder of this section damage will be interpreted to mean both documented and suspected incidents/events unless otherwise noted.

Damage was identified for at least 138 sites, or 64 percent, of the sites evaluated. As noted in Section B.2.4, all of the sites indicated contamination (92 percent). Damage was indicated in approximately 70 percent of the contaminated sites evaluated. Of the 286 affected areas indicating damage, only 93 (32 percent) could be documented using the evaluation criteria.

Sites indicating the absense of damage, and/or files not containing sufficient information to determine damage, were also identified. A tabulation of sties identified with damage for at least one of the above categories is outlined in Table B.2-9. Of note, are the 86 sites (40 percent) identified as having damage to two or more affected areas. Of the 133 sites indicating soil contamination, 57 sites also indicated damage to drinking water. Also, of the 163 sites indicating soil and/or surface water contamination, 68 sites also indicated damage to flora, fauna or the food chain.

Table B.2-7

USEPA REGION II
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF CHEMICALS DOCUMENTED IN CONTAMINATION INCIDENTS

Chemical Category	Total Positive Identifications	Percent of Total
Volatile Halogenated Organics (VHOs)	53	19
Volatile Non-halogenated Organics (VNHOs)	41	15
Base Neutral Extractables (BNEs)	25	9
Pesticides	11	4
PCBs	20	7
Metals	60	21
Oil	2	1
Ammonia/Ammonia Compounds	6	2
Inorganics	25	9
Cyanide	3	1
Acids	8	3
Acid Compounds	19	7
Alkalies	0	0
Alcohols	2	1
Aldehydes	0	0
Ketones	3	1
Radioactive	1	0
Asbestos	2	1
Others	0	0
Total	281	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-8

USEPA REGION II
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

CONCENTRATION OF SELECTED CONTAMINANTS IDENTIFIED BY MEDIA

Most Frequently Observed Chemical Category	Contaminant	Contaminant Concentration Range			
		Groundwater (mg/l)	Surface Water (mg/l)	Soil (mg/kg)	Air (mg/l)
VHOs	1,1,1 trichloroethane	trace- 1.36	trace- 1.8	trace- 1.1	ND
	trichloroethylene	0.012- 3.3	trace- 7.50	ND	ND
	dichloromethane	0.132- 2.0	13.5- 17.0	ND	ND
VNHOs	benzene	0.002- 72.5	0.09- 0.5	18.5- 43.0	ND
	toluene	0.0009-30.0	trace- 2.00	trace-64.0	ND
	xylene	0.015- 0.35	trace- 1.20	2.0- 3.8	ND
Metals	lead	0.05- 100	LT 0.10-65.0	1500-5750	ND
	arsenic	0.003- 3.4	0.076-4.6	7.0- 41.0	ND
	chromium	trace- 10.0	0.01- 1.91	85-31765	ND

NOTES:

ND = no data available
LT = less than

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-9

USEPA REGION II
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES DAMAGED

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented damage (to at least one affected area)	56	27
2	Sites indicating suspected damage (to at least one affected area) and not identified by Category 1 above	81	37
3	Sites indicating documented or suspected absence of damage and not identified by Categories 1 and 2 above	25	12
4	Sites for which there was an absence of sufficient information in the file to make a determination of damage and not identified by Categories 1,2 and 3 above	52	24
	TOTAL SITES	214	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

B.2.7.1 Tabulation of Number, Type and Severity of Damage Incidents. Table B.2-10 summarizes the total number of DISF responses indicating damage to the above affected areas. Site files not containing sufficient information to determine damage were also recorded and noted under the appropriate heading in Table B.2-10.

Table B.2-10 indicates that 36 percent of the documented damage incidents occurred to property, with the remaining incidents occurring to drinking water (28 percent), flora (18 percent) and human health (7 percent). Documented damage to food chain and fauna represented the remaining 11 percent of the incidents recorded.

Table B.2-10 indicates that of the 214 sites evaluated, 35 sites (16 percent) indicated high environmental damage, 26 sites (13 percent) indicated medium environmental damage and 57 sites (27 percent) indicated low environmental damage. The remaining 96 site files indicated no apparent damage (14 percent) or did not have enough information available (31 percent) to make an evaluation. Of note, are the files associated with the 21 sites (10 percent) which suggested that the actual damage may be higher than the response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

The analysis also indicated that out of the 214 sites evaluated, 2 sites (1 percent) indicated high human health damage, 6 sites (3 percent) indicated medium human health damage and 7 sites (3 percent) indicated low human health damage. The remaining 199 sites indicated no apparent damage (49 percent) or did not have enough information available to make an evaluation (44 percent). Of note, are the files associated with 6 sites (3 percent) which suggested that the actual human health damage may be higher than the severity response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

B.2.7.2 Tabulation of Number and Severity of Damage Incidents by Facility Type. Table B.2-11 summarizes the DISF responses indicating damage to each affected area by associated facility type. This analysis indicates that approximately 81 percent of the damage incidents were associated with landfills (36 percent), storage facilities (30 percent) or surface impoundments (15 percent). The remaining 19 percent of the damage incidents were associated with midnight dumps, open dumps, incinerators, recycling/reclamation, and 6 other categories.

Table B.2-11 also indicates that 82 percent of the incidents involving damage to drinking water involved landfills (39 percent), containers and tanks (27 percent) and surface impoundments (16 percent). Table B.2-11 also identifies the severity of damage to environment and/or human health. Landfills, storage facilities and surface impoundments resulted in 83 percent of the cases involving high or medium environmental damage and 74 percent of the cases involving high or medium human health damage.

B.2.8 Status of Response. Table B.2-12 summarizes the status of each site evaluated from the standpoint of enforcement, investigative and remedial activites. This table indicates that only 20 percent of the files evaluated indicated that the sites identified were involved in either past or present legal or enforcement actions. However, 128 (60 percent) site

Table B.2-10

USEPA REGION II
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY OF DAMAGE INCIDENTS

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	25	58	8	40	83	214
Food Chain	2	21	0	84	107	214
Flora	16	24	1	45	128	214
Fauna	7	42	1	67	97	214
Human Health	7	44	0	53	110	214
Property Damage	33	9	0	78	94	214

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	35	26	57	66	30	214
Human Health	2	6	7	94	105	214

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-11

USEPA REGION II
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY DAMAGE INCIDENTS BY FACILITY TYPE

Landfill

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	9	43	4	20	55	131
Food Chain	0	15	0	47	69	131
Flora	4	20	1	19	87	131
Fauna	2	32	1	34	62	131
Human Health	0	22	0	34	75	131
Property Damage	9	13	0	44	65	131

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	9	8	21	71	22	131
Human Health	0	3	3	76	49	131

Open Dump

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	1	8	1	4	6	20
Food Chain	0	2	0	8	10	20
Flora	4	2	0	4	10	20
Fauna	0	2	0	6	12	20
Human Health	0	3	0	5	12	20
Property Damage	0	1	0	8	11	20

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses

Table B.2-11 (cont'd)(1)

Surface Impoundments

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	5	16	2	9	18	50
Food Chain	0	5	0	22	23	50
Flora	3	7	0	11	29	50
Fauna	1	14	0	14	21	50
Human Health	0	9	0	15	26	50
Property Damage	6	5	0	23	16	50

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	6	2	8	29	5	50
Human Health	0	1	1	33	15	50

Incinerator

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	7	0	7
Food Chain	0	0	0	7	0	7
Flora	0	0	0	7	0	7
Fauna	0	0	0	6	1	7
Human Health	0	1	0	3	3	7
Property Damage	0	0	0	7	0	7

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	1	4	2	7
Human Health	0	0	0	5	2	7

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-11 (cont'd)(1)

Injection Well

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	1	0	1
Food Chain	0	0	0	1	0	1
Flora	0	0	0	1	0	1
Fauna	0	0	0	1	0	1
Human Health	0	0	0	1	0	1
Property Damage	0	0	0	1	0	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	0	1	1
Human Health	0	0	0	0	1	1

Land Treatment

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	1	0	0	0	1
Food Chain	0	0	0	0	1	1
Flora	0	0	0	0	1	1
Fauna	0	0	0	0	1	1
Human Health	0	1	0	0	0	1
Property Damage	0	0	0	0	1	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	1	0	1
Human Health	0	0	0	1	0	1

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-11 (cont'd)(1)

Transportation Spill Site

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	2	0	2
Food Chain	0	0	0	1	1	2
Flora	0	0	0	1	1	2
Fauna	0	0	0	1	1	2
Human Health	0	1	0	1	0	2
Property Damage	0	1	0	0	1	2

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	1	1	2
Human Health	0	0	0	1	1	2

Storage Treatment Containers

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	1	26	3	17	35	82
Food Chain	0	8	0	32	42	82
Flora	0	14	1	18	49	82
Fauna	1	18	1	26	36	82
Human Health	2	20	0	25	35	82
Property Damage	4	16	0	33	29	82

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	2	10	56	12	82
Human Health	0	1	0	51	30	82

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-11 (cont'd)(1)

Storage Treatment Tanks

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	9	0	7	9	25
Food Chain	0	2	0	12	11	25
Flora	0	4	0	9	12	25
Fauna	0	6	0	10	9	25
Human Health	1	8	0	8	8	25
Property Damage	0	4	0	12	9	25

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	3	18	4	25
Human Health	0	0	0	18	7	25

Storage Treatment Piles

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	3	0	2	2	7
Food Chain	0	1	0	3	3	7
Flora	0	0	0	2	5	7
Fauna	0	2	0	3	2	7
Human Health	0	3	0	2	2	7
Property Damage	1	2	0	3	1	7

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	1	4	2	7
Human Health	0	0	0	5	2	7

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.2-11 (cont'd)(1)

Boilers Using Waste as Fuel

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	2	1	3
Food Chain	0	0	0	2	1	3
Flora	0	0	0	2	1	3
Fauna	0	0	0	2	1	3
Human Health	0	0	0	1	2	3
Property Damage	0	0	0	2	1	3

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	1	2	3
Human Health	0	0	0	1	2	3

Recycling/Reclamation

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	2	0	5	5	12
Food Chain	0	0	0	6	6	12
Flora	0	1	0	5	6	12
Fauna	0	2	0	5	5	12
Human Health	0	2	0	5	5	12
Property Damage	0	1	0	6	5	12

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	1	0	6	5	12
Human Health	0	0	0	7	5	12

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.2-11 (cont'd)(1)

Midnight Dump

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	1	6	0	2	14	23
Food Chain	0	4	0	5	14	23
Flora	2	3	0	2	16	23
Fauna	0	9	0	6	8	23
Human Health	0	7	0	4	12	23
Property Damage	1	5	0	6	11	23

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	1	1	17	2	23
Human Health	0	1	0	16	6	23

Wastewater Discharge

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	2	0	3	8	13
Food Chain	0	1	0	3	9	13
Flora	0	1	0	2	10	13
Fauna	0	5	0	0	8	13
Human Health	0	0	0	3	10	13
Property Damage	0	0	0	4	9	13

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	1	10	1	13
Human Health	0	0	0	7	6	13

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.2-12

USEPA REGION II
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

STATUS OF RESPONSE

Total Number of Sites...

...evaluated	...with legal/enforcement action underway/completed	...with investigative actions underway/completed	...with remedial actions underway/completed
214	43	128	48

DESCRIPTION OF REMEDIAL ACTIVITY

Damage Incident	Facility type	Location	Remedial Activity	Costs ($)
1. Leachate	OD	Pemberton, NJ	Remedial action by Burlington County Health Department. Details not available	30,000
2. Leaks	STC	Jamesburg, NJ	Remove drums from indoor to outdoor with fire safety measure and site cleanup	45,000
3. Leaks	SI,STC, STT	Oswego, NY	Remove drums	300,000
4. Leaks	SI, STT	Moira, NY	Develop secure landfill on-site for PCB wastes	50,000 (Phase I)
5. Leachate	LF, STC	Edison, NJ	Control leachate see page (short-term)	300,000 (short-term) 2.3-153.5 million dollars (long-term)
6. Leachate	LF, STC	Niagara Falls, NY	Evacuate residents and purchase properties in the immediate area	4,000,000

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

files indicated that additional environmental investigations were in progress or completed. Forty-eight (22 percent) sites were reported to be involved with past or present remedial activities.

Table B.2-12 also compares the damage incident type with the remedial activities and related costs for sites having cost data available. These activities included site cleanups, drum removal and disposal, landfill development, leachate control, resident evacuation, and property purchases. Expenditures for remedial activities for the sites ranged from $30,000 to $153.5 million.

Section B.3

B.3 Region III Summary

B.3.1 Region III Overview. The study team evaluated and completed DISFs for 164 sites in Region III. Many of these sites contained multiple facilities. A total of 317 facility types were used in describing the sites in this region. Of the 317 facility types evaluated, 27 percent were landfills, 19 percent were containers, 14 percent were surface impoundments, and 9 percent were tanks. The remaining 31 percent of the facility types were described by various other categories. As discussed in Sections 3.1 and 3.2 the reader should note for the following discussion that the data bases and the selection criteria utilized on this study limit the applicability of the conclusion reached herein to other populations of hazardous waste sites.

Contamination, either documented or suspected, was identified in 151 of the sites evaluated. At 93 of the sites, or 57 percent, contamination was documented. Thirty-eight percent of the contamination incidents occurred to groundwater, with the remaining incidents occurring to soil (28 percent), surface water (27 percent) and air (7 percent). Of the 366 responses originally indicating contamination, only 126 (34 percent) could be documented using the evaluation criteria developed in Section 3.1.4. Each site was evaluated for damage occurring to life, property and various natural resources. This evaluation focused on six potentially affected areas, including drinking water, food chain, flora, fauna, human health and property. Damage, (either documented or suspected), was identified in at least 119 sites, or 73 percent of the sites evaluated. Of the 301 affected areas originally indicating damage, only 96 (32 percent) could be documented using the evaluation criteria. Approximately 44 percent of the documented damage incidents occurred to drinking water, with the remaining incidents occurring to property (28 percent), flora (10 percent), human health (6 percent), fauna and foodchain, (12 percent). There were six incidents involving documented damage to human health. There were 11 sites where documented damage to drinking water occurred from an unknown source or sources. At these sites public water supply wells had to be closed or restricted due to groundwater contamination. Sixty-eight percent of the incidents causing the damage or contamination described above were due to leachate (33 percent), leaks (18 percent) or spills (17 percent). These incidents involved contamination caused by volatile halogenated organics, volatile nonhalogenated organics or metals in 64 percent of the incidents tabulated.

B.3.2 Sources. The study team preliminarily identified 182 files in Region III for review. File sources included 67 FIT Files, 105 S&A Files and 10 Enforcement Files. Based upon a review of the 182 sites, 18 were eliminated from the study because they did not conform to the Selection Criteria summarized in Section 3.1, Table 3.1-1.

B.3.3 Tabulation of Site Descriptions by Facility Type. Each site was evaluated and categorized by one or more of the following fourteen site descriptions as listed in Section IIA of the DISFs.

- Landfill Facility
- Open Dump
- Surface Impoundment
- Incinerator
- Injection Well
- Land Treatment
- Transportation Spill Site
- Storage/Treatment Containers
- Storage/Treatment Tanks
- Storage/Treatment Piles
- Boilers Using Waste as Fuel
- Recycling/Reclamation
- Midnight Dump
- Other

For the 164 sites evaluated in the region, all of these categories were identified at least once, along with an additional 3 "other" categories not listed in the DISF. These other categories included liquid discharges, open burning, and "unknown" facility sources. Table B.3-1 summarizes the total number of facility types used in describing the 164 sites evaluated. Many of these sites contained multiple facilities. A total of 317 facility types were used in describing the sites in this region. Of the 317 facility types evaluated, approximately 75 percent were identified as either landfills (27 percent), containers (19 percent), surface impoundments (14 percent), tanks (9 percent) or midnight dumps (6 percent). Approximately 96 sites were described by 2 or more facility types and 48 sites by 3 or more facility types.

B.3.4 Contamination Incidents. Four media, i.e. groundwater, surface water, air and soil, were evaluated for site-related contamination in Section V of the DISF. In the remainder of this section, contamination will be interpreted to mean both documented and suspected incidents/ events, unless otherwise noted. Sites indicating the absence of contamination, and/or files not containing sufficient information to determine the presence of contamination, were also identified. Table B.3-2 summarizes the number of sites identified with contamination in at least one of the above media.

Contamination incidents were identified at 151 (92 percent) of the sites evaluated. A total of 366 incidents involving various media were recorded at these sites of which 126 (34 percent) could be documented by sampling and analytical data. One hundred twenty-four sites were identified with contamination in two or more media. For example, of the 102 sites indicating soil contamination, 94 sites also indicated groundwater contamination. File data indicated that 131 sites were contaminated from incident(s) occurring at the site evaluated. File data for the remaining 20 sites indicated that contamination may have originated off-site.

B.3.4.1 Tabulation of Media Exposed to Contamination. Table B.3-3 summarizes the total number of DISF responses indicating contamination or the absence of contamination found by media. Site files not containing sufficient information to determine contamination were also recorded for each of the media evaluated and noted under the appropriate heading in Table B.3-3. This table indicates that 38 percent of the contamination incidents occurred to groundwater. The remaining incidents occurred to either soil (28 percent), surface water (27 percent) or air (7 percent). In many cases, contamination to more than one media occurred at any particular site.

B.3.4.2 Tabulation of Media Exposed to Contamination Incidents by Facility Type. Table B.3-4 summarizes the total number of DISF responses indicating media contamination associated with each facility type. This analysis suggests that approximately 74 percent of the sites associated with contamination incidents were identified as either landfills (27 percent), containers (19 percent), surface impoundments (13 percent), tanks (9 percent) or open dumps (6 percent). Table B.3-4 indicates that, for most of the incidents tabulated, in decreasing order of occurrence, contamination to:

Table B.3-1

USEPA REGION III
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITE DESCRIPTIONS BY TYPE

Facility Type	Total Number of Responses Described as Given Facility Type	Percent of Total
Landfill	85	27
Open Dump	19	6
Surface Impoundment	43	14
Incinerator	4	1
Injection Well	4	1
Land Treatment	9	3
Transportation Spill Site	3	1
Storage/Treatment Containers	60	19
Storage/Treatment Tanks	28	9
Storage/Treatment Piles	10	3
Boilers Using Waste as Fuel	1	0
Recycling/Reclamation	12	4
Midnight Dump	20	6
Other	19	6
Total	317	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-2

USEPA REGION III
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES EXPOSED TO CONTAMINATION INCIDENTS

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented contamination (to at least one medium)	93	57
2	Sites indicating suspected contamination (to at least one medium) and not identified by Category 1 above	58	35
3	Sites indicating documented or suspected absence of contamination and not identified by Categories 1 and 2 above	9	6
4	Sites for which there was an absence of sufficient information in the file to make a determination of contamination, and not identified by Categories 1, 2 or 3 above	4	2
	TOTAL SITES	164	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.3-3

USEPA REGION III
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT

Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
	Documented	Suspected	Documented	Suspected		
Groundwater	71	68	11	8	6	164
Surface Water	25	75	9	41	14	164
Air	7	18	1	124	14	164
Soil	23	79	2	46	14	164

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.3-4

USEPA REGION III
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT BY FACILITY TYPE

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Landfill	Groundwater	17	52	7	8	1	85
	Surface Water	8	50	7	18	2	85
	Air	2	9	1	69	4	85
	Soil	3	40	2	28	12	85
Open Dump	Groundwater	2	16	1	0	0	19
	Surface Water	1	17	0	0	1	19
	Air	1	3	0	13	2	19
	Soil	1	15	0	1	2	19
Surface Impoundment	Groundwater	4	35	4	0	0	43
	Surface Water	3	29	2	6	3	43
	Air	9	6	0	31	6	43
	Soil	1	33	0	5	4	43
Incinerator	Groundwater	0	0	0	2	2	4
	Surface Water	0	0	0	2	2	4
	Air	0	3	0	0	1	4
	Soil	0	1	0	2	1	4

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.3-4 (cont'd)[(1)]

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Injection Well	Groundwater	2	2	0	0	0	4
	Surface Water	0	3	0	0	0	4
	Air	0	1	0	3	0	4
	Soil	0	3	0	1	0	4
Land Treatment	Groundwater	0	6	1	2	0	9
	Surface Water	0	6	0	3	0	9
	Air	0	2	0	7	0	9
	Soil	0	7	0	2	0	9
Transportation Spill Site	Groundwater	1	1	0	0	1	3
	Surface Water	0	0	0	1	2	3
	Air	0	0	0	2	1	3
	Soil	2	1	0	0	0	3
Storage Treatment Containers	Groundwater	4	42	2	8	4	60
	Surface Water	0	33	3	13	11	60
	Air	1	11	0	39	9	60
	Soil	3	38	0	12	7	60
Storage Treatment Tanks	Groundwater	2	18	1	6	1	28
	Surface Water	0	13	0	11	4	28
	Air	0	4	0	19	5	28
	Soil	1	19	1	6	2	28

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Storage Treatment Piles	Groundwater	1	7	1	1	0	10
	Surface Water	0	8	1	1	0	10
	Air	0	3	0	6	1	10
	Soil	1	7	0	3	0	10
Boilers Using Waste as Fuel	Groundwater	0	0	0	1	0	1
	Surface Water	0	0	0	1	0	1
	Air	0	0	0	1	0	1
	Soil	0	0	0	1	0	1
Recycling Reclamation	Groundwater	0	11	0	1	0	12
	Surface Water	0	8	0	1	3	12
	Air	0	3	0	7	2	12
	Soil	0	9	0	1	2	12
Midnight Dump	Groundwater	0	15	1	2	2	20
	Surface Water	0	15	1	2	2	20
	Air	1	2	0	15	2	20
	Soil	1	15	0	2	2	20

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

- groundwater was associated with landfills, containers, and surface impoundment;
- surface water was associated with landfills, containers, and surface impoundments;
- soil was associated with landfills, containers, and surface impoundments; and
- air was associated with containers, landfills, and surface impoundments.

B.3.5 Events Causing Contamination. Contaminated sites were associated with one or more of the following events, as outlined in Section VIII of the DISF.

- Fire/explosion
- Spill
- Leak
- Flood
- Seismic Activity
- Erosion
- Leachate
- Emission of Toxic Gases/Mists

In the remainder of this section, events tabulated will include both documented and suspected events, unless otherwise noted.

Seven of these events were identified at least once, along with three other types not listed in the DISF. These other events were described as a liquid discharge, runoff, and "unknown". A total of fifty-five sites (34 percent) were involved in two events and 43 sites (26 percent) in three or more events.

B.3.5.1 Tabulation of Events Causing Contamination Incidents. Table B.3-5 summarizes the total number of events causing contamination incidents. In total, 320 contamination events involving various facility types were recorded in the DISFs. For this region, this tabulation indicates that approximately 68 percent of the contamination events were related to leachate (33 percent), leaks (18 percent) or spills (17 percent). Of the 320 contamination events tabulated, 208 (65 percent) could be documented from information available in the file.

B.3.5.2 Tabulation of Events Causing Contamination Incidents By Facility Type. Table B.3-6 summarizes the events causing contamination incidents at various facility types. Since a number of sites contained a multiple number of facilities, there were a number of cases where there was insufficient information available in the file to identify the damage incident with the specific facility unit in question. These represented approximately 10 percent of the total and are identified in Table B.3-6.

This analysis indicates that approximately 70 percent of the leachate events were associated with landfills (38 percent), surface impoundments (17 percent) or containers (15 percent). Leaks were found to occur primarily at container storage facilities. Approximately 70 percent of the spill events were associated with storage or treatment facilities (all types) (51 percent), landfills (10 percent), and surface impoundments (9 percent). Air pollution events, i.e., emissions of toxic gases and mists, were most commonly associated with containers (32 percent) open dumps (14 percent), and incinerators (14 percent). Facilities having the highest frequency of fires and explosions were landfills (48 percent) and containers and dumps (24 percent).

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Table B.3-5

USEPA REGION III
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS

Event	Documented	Suspected	Total
Fire/Explosion	14	6	20
Spills	40	14	54
Leaks	35	21	56
Flood	1	4	5
Seismic Activity	0	0	0
Erosion	15	9	24
Leachate	70	37	107
Emission of Toxic Gases/Mists	3	9	12
Other	30	12	42
Total	208	112	320

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.3-6

USEPA REGION III
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS BY FACILITY TYPE

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Landfill	Fire/Explosion	8	6	2	16
	Spills	5	5	3	13
	Leaks	6	6	2	14
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	10	7	1	18
	Leachate	37	35	2	74
	Emission of Toxic Gases/Mists	0	2	1	3
	Other	1	0	0	1
Open Dump	Fire/Explosion	1	2	1	4
	Spills	5	4	2	11
	Leaks	3	5	1	9
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	1	1	0	2
	Leachate	4	9	2	18
	Emission of Toxic Gases/Mists	0	3	0	3
	Other	0	1	0	1
Surface Impoundments	Fire/Explosion	0	0	0	0
	Spills	2	5	2	9
	Leaks	8	9	3	20
	Flood	1	2	0	3
	Seismic Activity	0	0	0	0
	Erosion	2	6	3	11
	Leachate	9	24	0	33
	Emission of Toxic Gases/Mists	0	2	0	2
	Other	4	0	0	4

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Incinerator	Fire/Explosion	0	0	0	0
	Spills	0	2	0	2
	Leaks	0	3	0	3
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	0	3	1	4
	Other	0	0	0	0
Injection Well	Fire/Explosion	0	0	0	0
	Spills	0	1	0	1
	Leaks	0	1	0	1
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	4	0	0	4
Land Treatment	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	3	0	3
	Leachate	0	5	0	5
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	2	0	0	2
Transportation Spill Site	Fire/Explosion	0	0	0	0
	Spills	3	0	0	3
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	1	0	2
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.3-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Storage Treatment Containers	Fire/Explosion	4	3	0	7
	Spills	17	16	5	38
	Leaks	14	19	4	37
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	1	0	1
	Leachate	3	26	0	29
	Emission of Toxic Gases/Mists	1	6	3	10
	Other	0	0	0	0
Storage Treatment Tanks	Fire/Explosion	1	0	0	1
	Spills	8	9	3	20
	Leaks	6	11	2	19
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	3	6	0	9
	Emission of Toxic Gases/Mists	0	1	1	2
	Other	2	1	0	3
Storage Treatment Piles	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	1	0	1
	Leachate	4	3	2	9
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	1	1	0	2
Boilers Using Waste as Fuel(2)	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.3-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Recycling Reclamation	Fire/Explosion	0	0	0	0
	Spills	3	5	2	10
	Leaks	2	5	2	9
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	2	3	1	6
	Emission of Toxic Gases/Mists	0	1	2	3
	Other	1	1	0	2
Midnight Dump	Fire/Explosion	1	3	2	6
	Spills	4	5	3	12
	Leaks	4	4	2	10
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	1	0	1
	Leachate	0	12	2	14
	Emission of Toxic Gases/Mists	0	2	0	2
	Other	3	1	0	4

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

B.3.6 Chemicals Documented in Contamination Incidents. For this analysis, chemical compounds were organized into the following general categories:

- Volatile Halogenated Organics (VHOs)
- Volatile Non-halogenated Organics (VNHOs)
- Base Neutral Extractables (BNEs)
- Pesticides
- PCBs
- Metals
- Oil
- Ammonia/Ammonia Compounds
- Asbestos
- Inorganics
- Cyanide
- Acids
- Acid Compounds
- Alkalies
- Alcohols
- Aldehydes
- Ketones
- Radioactive

Table B.3-7 summarizes the total number of times that a chemical in a given category was positively identified by sampling and analytical techniques as occurring as contaminants in the various media.

Sixteen of these chemical categories were identified at least once. This tabulation indicates that approximately 64 percent of the chemical categories were identified as either VHOs (29 percent), metals (19 percent) or VNHOs (16 percent). Table B.3-8 lists the most commonly occurring chemicals found in each of these categories, and the range of concentrations observed in the affected media.

B.3.7 Damage Incidents. The following six affected areas were evaluated for site related damage on the DISF.

- Drinking Water
- Food Chain
- Flora
- Fauna
- Human Health
- Property Damage

In the remainder of this section damage will be interpreted to mean both documented and suspected incidents/events unless otherwise noted.

Damage was identified for at least 119 sites, or 73 percent, of the sites evaluated. As noted in Section B.3.4, higher percentages of the sites indicated contamination (92 percent). Damage was indicated in approximately 79 percent of the contaminated sites evaluated. Of the 301 affected areas indicating damage, only 96 (32 percent) could be documented using the evaluation criteria.

Sites indicating the absence of damage, and/or files not containing sufficient information to determine damage, were also identified. A tabulation of sites identified with damage for at least one of the above categories is outlined in Table B.3-9. Of note, are the 88 sites (54 percent) identified as having damage to two or more affected areas. Of the 102 sites indicating soil contamination, 61 sites also indicated damage to drinking water. Also, of the 127 sites indicating soil and/or surface water contamination, 58 sites also indicated damage to flora, fauna or the food chain.

B.3.7.1 Tabulation of Number, Type and Severity of Damage Incidents. Table B.3-10 summarizes the total number of DISF responses indicating damage to the above affected areas. Site files not containing sufficient information to determine damage were also recorded and noted under the appropriate heading in Table B.3-10.

Table B.3-7

USEPA REGION III
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF CHEMICALS DOCUMENTED IN CONTAMINATION INCIDENTS

Chemical Category	Total Positive Identifications	Percent of Total
Volatile Halogenated Organics (VHOs)	58	29
Volatile Non-halogenated Organics (VNHOs)	33	16
Base Neutral Extractables (BNEs)	13	6
Pesticides	5	3
PCBs	10	5
Metals	38	19
Oil	0	0
Ammonia/Ammonia Compounds	2	1
Inorganics	6	3
Cyanide	4	2
Acids	5	3
Acid Compounds	19	10
Alkalies	0	0
Alcohols	2	1
Aldehydes	1	0
Ketones	3	2
Radioactive	1	0
Asbestos	1	0
Others	0	0
Total	201	100

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-8

USEPA REGION III
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

CONCENTRATION OF SELECTED CONTAMINANTS IDENTIFIED BY MEDIA

Most Frequently Observed Chemical Category	Contaminant	Contaminant Concentration Range Groundwater (mg/l)	Surface Water (mg/l)	Soil (mg/kg)	Air (mg/l)
VHOs	1,1,1 trichloroethane	0.006- 0.50	0.009- 1.60	0.080-1.37	ND
	trichloroethylene	0.001-12.0	0.004- 0.840	trace-0.10	ND
	tetrachloroethylene	0.002- 3.20	trace- 7.70	ND	ND
VNHOs	benzene	0.001- 0.50	0.004-22.0	ND	ND
	toluene	0.001- 0.40	0.001- 2.40	0.78 - 3.54	ND
	xylene	0.001- 1.00	0.040- 1.70	ND	ND
Metals	lead	0.001- 0.36	trace- 0.16	trace-0.630	ND
	nickel	0.029- 5.50	trace- 0.24	ND	ND
	chromium	0.006- 0.32	ND	0.110-960	ND

NOTES:

ND = no data available

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-9

USEPA REGION III
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES DAMAGED

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented damage (to at least one affected area)	62	38
2	Sites indicating suspected damage (to at least one affected area) and not identified by Category 1 above	57	35
3	Sites indicating documented or suspected absence of damage and not identified by Categories 1 and 2 above	21	13
4	Sites for which there was an absence of sufficient information in the file to make a determination of damage and not identified by Categories 1,2 and 3 above	24	15
	TOTAL SITES	164	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-10

USEPA REGION III
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY OF DAMAGE INCIDENTS

	Damage		No Damage		Insufficient Information Available in File	
Affected Area	Documented	Suspected	Documented	Suspected		Total
Drinking Water	42	49	13	45	15	164
Food Chain	4	22	0	108	30	164
Flora	10	27	1	98	28	164
Fauna	7	26	0	82	27	164
Human Health	6	58	0	82	18	164
Property Damage	27	23	0	92	22	164

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	29	38	44	39	17	164
Human Health	2	23	35	52	52	164

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-10 indicates that 44 percent of the documented damage incidents occurred to drinking water, with the remaining incidents occurring to property (28 percent), flora (10 percent) and human health (6 percent). Documented damage to food chain and fauna represented the remaining 12 percent of the incidents recorded. Of note are 11 sites where one or more public water supply wells were contaminated by VHOs and were closed or restricted.

Table B.3-10 indicates that of the 164 sites evaluated, 29 sites (18 percent) indicated high environmental damage, 38 sites (23 percent) indicated medium environmental damage and 41 sites (25 percent) indicated low environmental damage. The remaining 56 site files indicated no apparent damage (10 percent) or did not have enough information available to make an evaluation (24 percent). Of note, are the files associated with the 82 sites (50 percent) which suggested that the actual damage may be higher than the response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

The analysis also indicated that out of the 164 sites evaluated, 2 sites indicated high human health damage, 23 sites (14 percent) indicated medium human health damage and 35 sites (21 percent) indicated low human health damage. The remaining 104 sites indicated no apparent damage (i.e., there was no data available on public health damages) (32 percent) or while there was some data, there was not enough information available to make an evaluation (32 percent). Of note, are the files associated with 82 sites (50 percent) which suggested that the actual human health damage may be higher than the severity response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

B.3.7.2 Tabulation of Number and Severity of Damage Incidents by Facility Type. Table B.3-11 summarizes the DISF responses indicating damage to each affected area by associated facility type. This analysis indicates that approximately 70 percent of the damage incidents were associated with storage facilities (32 percent), landfills (23 percent) or surface impoundments (15 percent). The remaining 30 percent of the damage incidents were associated with open dumps (10 percent), midnight dumps (8 percent) incinerators, recycling/reclamation, (5 percent) and 5 other categories (7 percent).

Table B.3-11 also indicates that 71 percent of the incidents involving damage to drinking water involved containers and tanks (34 percent) landfills (24 percent), and surface impoundments (13 percent). Table B.3-11 also identifies the severity of damage to environment and/or human health. Landfills, storage facilities and surface impoundments resulted in 75 percent of the cases involving high or medium environmental damage and 78 percent of the cases involving high or medium human health damage.

B.3.8 Status of Response. Table B.3-12 summarizes the status of each site evaluated from the standpoint of enforcement, investigative and remedial activites. This table indicates that only 17 percent of the files evaluated indicated that the sites identified were involved in either past or present legal or enforcement actions. However, 76 (46 percent) site files indicated that additional environmental investigations were in progress or completed. Forty-two (26 percent) sites were reported to be involved with past or present remedial activities.

Table B.3-11

USEPA REGION III
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[1]
TABULATION OF NUMBER & SEVERITY DAMAGE INCIDENTS BY FACILITY TYPE

Landfill

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	5	35	10	28	7	85
Food Chain	1	11	0	64	9	85
Flora	3	16	1	57	8	85
Fauna	2	14	0	61	8	85
Human Health	2	27	0	49	7	85
Property Damage	0	17	0	59	9	85

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	11	16	16	24	18	85
Human Health	0	4	10	28	43	85

Open Dump

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	10	3	1	3	2	19
Food Chain	0	5	0	9	5	19
Flora	1	8	0	4	6	19
Fauna	1	9	0	4	5	19
Human Health	2	9	0	5	3	19
Property Damage	1	6	0	10	2	19

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	3	4	6	6	0	19
Human Health	0	0	7	9	3	19

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-11 (cont'd)(1)

Surface Impoundments

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	2	20	3	13	5	42
Food Chain	1	12	0	21	9	42
Flora	1	8	0	22	12	42
Fauna	3	8	0	23	9	42
Human Health	1	19	0	18	5	42
Property Damage	2	15	0	18	8	42

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	5	12	6	14	6	43
Human Health	2	3	8	15	15	43

Incinerator

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	2	2	4
Food Chain	0	0	0	3	1	4
Flora	0	0	0	3	1	4
Fauna	0	0	0	3	1	4
Human Health	0	2	0	1	1	4
Property Damage	0	1	0	2	1	4

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	1	0	3	0	4
Human Health	0	0	1	2	1	4

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-11 (cont'd)(1)

Injection Well

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	1	3	0	0	0	4
Food Chain	0	1	0	1	2	4
Flora	0	2	0	2	0	4
Fauna	0	2	0	2	0	4
Human Health	0	4	0	0	0	4
Property Damage	2	1	0	1	0	4

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	2	1	0	0	4
Human Health	0	0	3	1	0	4

Land Treatment

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	4	1	3	1	9
Food Chain	0	4	0	5	0	9
Flora	0	2	0	6	1	9
Fauna	0	1	0	7	1	9
Human Health	0	3	0	6	0	9
Property Damage	0	4	0	5	0	9

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	1	4	1	3	9
Human Health	0	0	1	2	6	9

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-11 (cont'd)(1)

Transportation Spill Site

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	1	0	1	1	3
Food Chain	0	1	0	1	1	3
Flora	0	0	0	2	1	3
Fauna	0	0	0	2	1	3
Human Health	0	2	0	0	1	3
Property Damage	1	1	0	0	1	3

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	2	1	0	0	3
Human Health	0	1	1	0	1	3

Storage Treatment Containers

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	3	34	2	16	5	60
Food Chain	0	11	1	39	9	60
Flora	0	12	0	37	11	60
Fauna	0	12	0	39	9	60
Human Health	1	23	0	27	9	60
Property Damage	4	17	0	32	7	60

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	9	14	10	21	6	60
Human Health	0	5	11	27	17	60

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-11 (cont'd)(1)

Storage Treatment Tanks

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	2	16	1	6	3	28
Food Chain	0	7	0	17	4	28
Flora	1	4	0	13	10	28
Fauna	0	4	0	16	8	28
Human Health	0	11	0	9	8	28
Property Damage	2	9	0	9	8	28

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	8	7	3	8	2	28
Human Health	0	3	5	16	4	28

Storage Treatment Piles

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	5	0	3	2	10
Food Chain	0	4	0	5	1	10
Flora	0	2	0	4	4	10
Fauna	0	2	0	4	4	10
Human Health	0	1	0	6	3	10
Property Damage	0	0	0	5	5	10

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	2	3	3	2	10
Human Health	0	0	1	4	5	10

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.3-11 (cont'd)(1)

Boilers Using Waste as Fuel

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	1	0	1
Food Chain	0	0	0	1	0	1
Flora	0	0	0	1	0	1
Fauna	0	0	0	1	0	1
Human Health	0	0	0	1	0	1
Property Damage	0	0	0	1	0	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	0	1	1
Human Health	0	0	0	0	1	1

Recycling/Reclamation

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	1	8	0	2	1	12
Food Chain	0	4	0	4	4	12
Flora	0	2	0	4	6	12
Fauna	0	4	0	4	4	12
Human Health	0	7	0	1	4	12
Property Damage	0	5	0	3	4	12

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	4	4	1	3	0	12
Human Health	0	2	3	6	1	12

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-11 (cont'd)(1)

Midnight Dump

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	11	0	8	1	20
Food Chain	0	6	0	11	3	20
Flora	0	7	0	10	3	20
Fauna	0	7	0	11	2	20
Human Health	0	9	0	10	1	20
Property Damage	0	12	0	8	0	20

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	4	4	8	2	20
Human Health	0	2	3	8	7	20

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.3-12

USEPA REGION III
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[1]

STATUS OF RESPONSE

Total Number of Sites...

...evaluated	...with legal/ enforcement action underway/completed	...with investigative actions underway/completed	...with remedial actions underway/completed
164	28	76	42

DESCRIPTION OF REMEDIAL ACTIVITY

	Damage Incident	Facility type	Location	Remedial Activity	Costs ($)
1.	Spill Leak	LF	Pittsburgh, PA	Removal of contaminated soil	up to $24 million
2.	Spill	SI	E. Petersburg, PA	Repair berms, removal of soil	70,000
3.	Unknown	Unknown	S.E. Pennsylvania	Treat public water supply (wells) with activated carbon adsorbents	25,000 per well
4.	Spill	SI	Staunton, VA	Repair berms, remove spillage and soil	150,000
5.	Spill Leak	MD	Chester, PA	Remove waste and soil	3,000,000
6.	Leak	LF	Ft. Belvoir, VA	Gas interception and treatment	3,000,000

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.3-12 also compares the damage incident type with the remedial activities and related costs for sites having cost data available. These activities included removal of wastes and groundwater withdrawal and treatment. Expenditures for remedial activities for the sites ranged from $25,000 to $24 million.

Section B.4

B.4 Region IV Summary

B.4.1 Region IV Overview. The study team evaluated and completed DISFs for 151 sites in Region IV. Many of these sites contained multiple facilities. A total of 279 facility types were used in describing the sites in this region. Of the 279 facility types evaluated, 17 percent were containers, 18 percent were landfills, 12 percent were tanks and 16 percent were surface impoundments. The remaining 27 percent of the facility types were described by various other categories. As discussed in Sections 3.1 and 3.2 the reader should note for the following discussion that the data bases and the selection criteria utilized on this study limit the applicability of the conclusion reached herein to other populations of hazardous waste sites.

Contamination, either documented or suspected, was identified in 146 of the sites evaluated. At 120 of the sites, or 79 percent, contamination was documented. Thirty-seven percent of the contamination incidents occurred to soil, with the remaining incidents occurring to surface water (33 percent), groundwater (28 percent), and air (3 percent). Of the 312 responses originally indicating contamination, only 190 (61 percent) could be documented using the evaluation criteria developed in Section 3.1.4. Each site was evaluated for damage occurring to life, property and various natural resources. This evaluation focused on six potentially affected areas, including drinking water, food chain, flora, fauna, human health and property. Damage, (either documented or suspected), was identified in at least 81 sites, or 54 percent of the sites evaluated. Of the 151 affected areas originally indicating damage, only 47 (31 percent) could be documented using the evaluation criteria. Approximately 30 percent of the documented damage incidents occurred to flora, with the remaining incidents occurring to drinking water (28 percent), fauna (23 percent), property (11 percent), food chain (6 percent) and human health (2 percent). There was one incident involving documented damage to human health. This incident involved a chemical reaction in containers at a reclamation facility sending nearby residents to the hospital. Seventy-eight percent of the incidents causing the damage or contamination described above were due to leachate (32 percent), leaks (25 percent) or spills (21 percent). These incidents involved contamination caused by volatile halogenated organics, volatile nonhalogenated organics or metals in 46 percent of the incidents tabulated.

B.4.2 Sources. The study team preliminarily identified 200 files in Region IV for review. File sources included 200 S&A Files. Based upon a review of the sites, 49 were eliminated from the study because they did not conform to the Selection Criteria summarized in Section 3.1, Table 3-1.

B.4.3 Tabulation of Site Descriptions by Facility Type. Each site was evaluated and categorized by one or more of the following fourteen site descriptions as listed in Section IIA of the DISFs.

- Landfill Facility
- Open Dump
- Surface Impoundment
- Incinerator
- Injection Well
- Land Treatment
- Transportation Spill Site
- Storage/Treatment Containers
- Storage/Treatment Tanks
- Storage/Treatment Piles
- Boilers Using Waste as Fuel
- Recycling/Reclamation
- Midnight Dump
- Other

For the 151 sites evaluated in the region, 11 of these categories were identified at least once. Table B.4-1 summarizes the total number of facility types used in describing the 151 sites evaluated. Many of these sites contained multiple facilities. A total of 279 facility types were used in describing the sites in this region. Of the 279 facility types evaluated, approximately 78 percent of the sites were identified as either containers (27 percent), landfills (18 percent), tanks (12 percent), surface impoundments (16 percent) or midnight dumps (5 percent). A total of 84 sites were described by 2 or more facility types and 30 sites by three or more facility types.

B.4.4 Contamination Incidents. Four media, i.e. groundwater, surface water, air and soil, were evaluated for site-related contamination in Section V of the DISF. In the remainder of this section, contamination will be interpreted to mean both documented and suspected incidents/events, unless otherwise noted. Sites indicating the absence of contamination, and/or files not containing sufficient information to determine the presence of contamination, were also identified. Table B.4-2 summarizes the number of sites identified with contamination in at least one of the above media.

Contamination incidents were identified at 146 of the sites evaluated. A total of 312 incidents involving various media were recorded at these sites of which 190 (61 percent) could be documented by sampling and analytical data. One hundred seven sites were identified with contamination in two or more media. For example, of the 114 sites indicating soil contamination, 60 sites also indicated groundwater contamination. File data indicated that 143 sites were contaminated from incident(s) occurring at the site evaluated. File data for the remaining 3 sites indicated that contamination may have originated off-site.

B.4.4.1 Tabulation of Media Exposed to Contamination. Table B.4-3 summarizes the total number of DISF responses indicating contamination or the absence of contamination found by media. Site files not containing sufficient information to determine contamination were also recorded for each of the media evaluated and noted under the appropriate heading in Table B.4-3. This table indicates that 37 percent of the contamination incidents occurred to soil. The remaining incidents occurred to either surface water (32 percent), groundwater (28 percent), or air (3 percent). In many cases, contamination to more than one media occurred at any particular site.

B.4.4.2 Tabulation of Media Exposed to Contamination Incidents by Facility Type. Table B.4-4 summarizes the total number of DISF responses indicating media contamination associated with each facility type. This analysis suggests that approximately 77 percent of the sites associated with contamination incidents were identified as either containers (26 percent), landfills (16 percent), tanks (12 percent), surface impoundments (18 percent) or midnight dumps (5 percent). Table B.4-4 indicates that, for most of the incidents tabulated, in decreasing order of occurrence, contamination to:

- groundwater was associated with landfills, containers, surface impoundment, and tanks;

Table B.4-1

USEPA REGION IV
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITE DESCRIPTIONS BY TYPE

Facility Type	Total Number of Responses Described as Given Facility Type	Percent of Total
Landfill	50	18
Open Dump	20	7
Surface Impoundment	44	16
Incinerator	15	5
Injection Well	2	1
Land Treatment	5	2
Storage/Treatment Containers	74	27
Storage/Treatment Tanks	34	12
Storage/Treatment Piles	6	2
Recycling/Reclamation	14	5
Midnight Dump	15	5
Other	0	0
Total	279	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.4-2

USEPA REGION IV
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES EXPOSED TO CONTAMINATION INCIDENTS

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented contamination (to at least one medium)	120	79
2	Sites indicating suspected contamination (to at least one medium) and not identified by Category 1 above	26	17
3	Sites indicating documented or suspected absence of contamination and not identified by Categories 1 and 2 above	1	1
4	Sites for which there was an absence of sufficient information in the file to make a determination of contamination, and not identified by Categories 1, 2 or 3 above	4	3
	TOTAL SITES	151	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.4-3

USEPA REGION IV
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT

Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
	Documented	Suspected	Documented	Suspected		
Groundwater	50	38	8	9	46	151
Surface Water	56	45	2	8	40	151
Air	3	6	0	55	87	151
Soil	81	33	0	7	30	151

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.4-4

USEPA REGION IV
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT BY FACILITY TYPE

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Landfill	Groundwater	19	11	6	1	13	50
	Surface Water	23	11	0	5	11	50
	Air	1	0	0	18	31	50
	Soil	21	11	0	5	13	50
Open Dump	Groundwater	3	6	0	2	9	20
	Surface Water	9	5	1	1	4	20
	Air	0	1	0	5	14	20
	Soil	15	3	0	2	0	20
Surface Impoundment	Groundwater	23	17	1	1	2	44
	Surface Water	20	18	1	0	5	44
	Air	0	0	1	24	19	44
	Soil	23	10	0	1	10	44
Incinerator	Groundwater	4	6	0	5	0	15
	Surface Water	6	6	0	3	0	15
	Air	0	1	0	5	9	15
	Soil	9	3	0	3	0	15

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.4-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Injection Well	Groundwater	1	0	0	0	1	2
	Surface Water	1	0	0	0	1	2
	Air	0	0	0	1	1	2
	Soil	0	0	0	0	2	2
Land Treatment	Groundwater	2	1	0	0	2	5
	Surface water	2	2	0	0	1	5
	Air	0	1	0	1	3	5
	Soil	4	0	0	0	1	5
Transportation Spill Site (2)	Groundwater						
	Surface Water						
	Air						
	Soil						
Storage Treatment Containers	Groundwater	19	16	2	10	27	74
	Surface Water	24	25	2	4	19	74
	Air	3	5	0	25	41	74
	Soil	47	18	1	3	5	74
Storage Treatment Tanks	Groundwater	11	11	0	1	11	34
	Surface Water	11	11	0	2	10	34
	Air	0	2	0	13	19	34
	Soil	18	7	0	1	8	34
Storage Treatment Piles	Groundwater	2	1	1	0	2	6
	Surface Water	1	3	0	0	2	6
	Air	0	2	0	1	3	6
	Soil	4	1	0	0	1	6

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.4-4 (cont'd)[1]

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Boilers Using Waste as Fuel[2]	Groundwater						
	Surface Water						
	Air						
	Soil						
Recycling Reclamation	Groundwater	4	4	0	1	5	14
	Surface Water	4	8	0	0	2	14
	Air	1	1	0	6	6	14
	Soil	10	2	0	0	2	14
Midnight Dump	Groundwater	4	5	1	1	4	15
	Surface Water	5	4	1	0	5	15
	Air	0	1	0	4	10	15
	Soil	9	4	0	0	2	15
Other[2]	Groundwater						
	Surface Water						
	Air						
	Soil						

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

- surface water was associated with landfills, containers, surface impoundments, and tanks;
- soil was associated with containers, landfills, surface impoundments, and tanks; and
- air was associated with containers, landfills, surface impoundments, and tanks.

B.4.5 Events Causing Contamination. Contaminated sites were associated with one or more of the following events, as outlined in Section VIII of the DISF.

- Fire/Explosion
- Spill
- Leak
- Flood
- Seismic Activity
- Erosion
- Leachate
- Emission of Toxic Gases/Mists

In the remainder of this section, events tabulated will include both documented and suspected events, unless otherwise noted.

Seven of these events were identified at least once, along with one other type not listed in the DISF. This other event was described as uncontrolled surface runoff. A total of 40 sites (26 percent) were involved in two events and 33 sites (22 percent) in three or more events.

B.4.5.1 Tabulation of Events Causing Contamination Incidents. Table B.4-5 summarizes the total number of events causing contamination incidents. In total, 250 contamination events involving various facility types were recorded in the DISFs. For this region, this tabulation indicates that approximately 78 percent of the contamination events were related to leachate (32 percent), leaks (25 percent) or spills (21 percent). Of the 250 contamination events tabulated, 157 (63 percent) could be documented from information available in the file.

B.4.5.2 Tabulation of Events Causing Contamination Incidents By Facility Type. Table B.4-6 summarizes the events causing contamination incidents at various facility types. Since a number of sites contained a multiple number of facilities, there were a number of cases where there was insufficient information available in the file to identify the damage incident with the specific facility unit in question. These represented approximately 10 percent of the total and are identified in Table B.4-6.

This analysis indicates that approximately 73 percent of the leachate events were associated with landfills (32 percent), containers (21 percent) or surface impoundments (20 percent). Leaks were found to occur primarily at container storage facilities. Approximately 62 percent of the spill events were associated with storage or treatment facilities (all types) (50 percent) and surface impoundments (12 percent). Air pollution events, i.e., emissions of toxic gases and mists, were most commonly associated with containers (33 percent) and incinerators (22 percent). Facilities having the highest frequency of fires and explosions were containers (39 percent).

Table B.4-5

USEPA REGION IV
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS

Event	Documented	Suspected	Total
Fire/Explosion	9	4	13
Spills	34	19	53
Leaks	34	29	63
Flood	2	3	5
Seismic Activity	0	0	0
Erosion	5	4	9
Leachate	51	30	81
Emission of Toxic Gases/Mists	3	3	6
Other	19	1	20
Total	157	93	250

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.4-6

USEPA REGION IV
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS BY FACILITY TYPE

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Landfill	Fire/Explosion	4	2	0	6
	Spills	3	4	1	8
	Leaks	5	7	1	13
	Flood	0	3	0	3
	Seismic Activity	0	0	0	0
	Erosion	3	1	0	4
	Leachate	30	14	3	47
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	6	1	0	7
Open Dump	Fire/Explosion	1	1	0	2
	Spills	7	3	0	10
	Leaks	8	1	0	9
	Flood	0	1	0	1
	Seismic Activity	0	0	0	0
	Erosion	3	0	0	3
	Leachate	9	4	0	13
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	1	0	0	1
Surface Impoundments	Fire/Explosion	1	0	1	2
	Spills	8	3	2	13
	Leaks	8	7	3	18
	Flood	1	0	0	1
	Seismic Activity	0	0	0	0
	Erosion	1	1	0	2
	Leachate	12	16	1	29
	Emission of Toxic Gases/Mists	1	0	0	1
	Other	8	2	0	10

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.4-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Incinerator	Fire/Explosion	0	0	0	0
	Spills	1	0	4	5
	Leaks	0	1	5	6
	Flood	0	0	1	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	2	2
	Leachate	0	0	5	5
	Emission of Toxic Gases/Mists	0	2	0	2
	Other	0	0	1	1
Injection Well	Fire/Explosion	0	0	0	0
	Spills	0	0	1	1
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	0	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Land Treatment	Fire/Explosion	0	0	0	0
	Spills	1	0	1	2
	Leaks	1	0	0	1
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	0	1	2
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	1	0	0	1
Transportation Spill Site (2)	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.4-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Storage Treatment Containers	Fire/Explosion	5	2	5	12
	Spills	17	16	5	38
	Leaks	22	20	2	44
	Flood	1	2	0	3
	Seismic Activity	0	0	0	0
	Erosion	2	2	1	5
	Leachate	20	9	2	31
	Emission of Toxic Gases/Mists	1	2	1	4
	Other	8	0	1	9
Storage Treatment Tanks	Fire/Explosion	1	0	4	5
	Spills	11	3	4	18
	Leaks	9	8	4	21
	Flood	0	0	1	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	1	1
	Leachate	4	4	1	9
	Emission of Toxic Gases/Mists	0	0	2	2
	Other	1	1	0	2
Storage Treatment Piles	Fire/Explosion	0	0	0	0
	Spills	1	0	0	1
	Leaks	1	0	2	3
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	2	0	1	3
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Boilers Using Waste as Fuel(2)	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.4-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Recycling Reclamation	Fire/Explosion	1	0	1	2
	Spills	2	5	1	8
	Leaks	2	7	1	10
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	1	1
	Leachate	2	1	0	3
	Emission of Toxic Gases/Mists	1	0	1	2
	Other	2	1	0	3
Midnight Dump	Fire/Explosion	0	0	1	1
	Spills	7	1	1	9
	Leaks	4	2	2	8
	Flood	0	1	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	1	1
	Leachate	1	7	1	9
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	1	0	0	1

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

B.4.6 Chemicals Documented in Contamination Incidents. For this analysis, chemical compounds were organized into the following general categories:

- Volatile Halogenated Organics (VHOs)
- Volatile Non-halogenated Organics (VNHOs)
- Base Neutral Extractables (BNEs)
- Pesticides
- PCBs
- Metals
- Oil
- Ammonia/Ammonia Compounds
- Asbestos
- Inorganics
- Cyanide
- Acids
- Acid Compounds
- Alkalies
- Alcohols
- Aldehydes
- Ketones
- Radioactive

Table B.4-7 summarizes the total number of times that a chemical in a given category was positively identified by sampling and analytical techniques as occurring as contaminants in the various media.

Fourteen of these chemical categories were identified at least once, along with five additional categories not listed above. These other categories included mercaptan, varsol, sodium chlorate, fecal coliform and aromatics. This tabulation indicates that approximately 46 percent of the chemical categories were identified as either VHOs (11 percent), VNHOs (11 percent) or metals (24 percent). Table B.4-8 lists the most commonly occurring chemicals found in each of these categories, and the range of concentrations observed in the affected media.

B.4.7 Damage Incidents. The following six affected areas were evaluated for site related damage on the DISF.

- Drinking Water
- Food Chain
- Flora
- Fauna
- Human Health
- Property Damage

In the remainder of this section damage will be interpreted to mean both documented and suspected incidents/events unless otherwise noted.

Damage was identified for at least 81 sites, or 54 percent, of the sites evaluated. As noted in Section B.4.4, higher percentages of the sites indicated contamination (96 percent). Damage was indicated in approximately 55 percent of the contaminated sites evaluated. Of the 151 affected areas indicating damage, only 47 (31 percent) could be documented using the evaluation criteria.

Sites indicating the absence of damage, and/or files not containing sufficient information to determine damage, were also identified. A tabulation of sites identified with damage for at least one of the above categories is outlined in Table B.4-9. Of note, are the 38 sites (25 percent) identified as having damage to two or more affected areas. Of the 114 sites indicating soil contamination, 32 sites also indicated damage to drinking water. Also, of the 130 sites indicating soil and/or surface water contamination, 44 sites also indicated damage to flora, fauna or the food chain.

Table B.4-7

USEPA REGION IV
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF CHEMICALS DOCUMENTED IN CONTAMINATION INCIDENTS

Chemical Category	Total Positive Identifications	Percent of Total
Volatile Halogenated Organics (VHOs)	38	11
Volatile Non-halogenated Organics (VNHOs)	36	11
Base Neutral Extractables (BNEs)	35	10
Pesticides	34	10
PCBs	25	7
Metals	81	24
Oil	6	2
Ammonia/Ammonia Compounds	4	1
Inorganics	0	0
Cyanide	24	7
Acids	11	3
Acid Compounds	30	9
Alkalies	0	0
Alcohols	2	1
Aldehydes	0	0
Ketones	5	2
Radioactive	1	0
Asbestos	0	0
Others	5	2
Total	337	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.4-8

USEPA REGION IV
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

CONCENTRATION OF SELECTED CONTAMINANTS IDENTIFIED BY MEDIA

Most Frequently Observed Chemical Category	Contaminant	Contaminant Concentration Range			
		Groundwater (mg/l)	Surface Water (mg/l)	Soil (mg/kg)	Air (mg/l)
VHOs	trichloroethylene	LT0.005- 0.156	1.9	1.1	ND
	tetrachloroethylene	LT0.010- 0.065	LT0.005-0.160	LT3	ND
	1, 1-dichloroethane	0.051-22	0.012- 1.7	ND	ND
VNHOs	benzene	0.017- 0.093	ND	1.2 -100	ND
	ethylbenzene	0.099- 820	0.029- 3.5	0.013- 3.1	ND
	toluene	0.007-0.425	0.210-GT1	0.013-1.3	ND
Metals	chromium	0.050- 1.49	0.018-220	0.17-6,512	ND
	lead	0.034- 39.08	0.040-325	0.112-190,000	ND
	zinc	0.025-2,390	0.013-775	11.9-17,480	ND

NOTES:

ND = no data available
LT = less than
GT = greater than

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.4-9

USEPA REGION IV
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES DAMAGED

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented damage (to at least one affected area)	31	21
2	Sites indicating suspected damage (to at least one affected area) and not identified by Category 1 above.	50	33
3	Sites indicating documented or suspected absence of damage and not identified by Categories 1 and 2 above	8	5
4	Sites for which there was an absence of sufficient information in the file to make a determination of damage and not identified by Categories 1,2 and 3 above	62	41
	TOTAL SITES	151	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

B.4.7.1 Tabulation of Number, Type and Severity of Damage Incidents. Table B.4-10 summarizes the total number of DISF responses indicating damage to the above affected areas. Site files not containing sufficient information to determine damage were also recorded and noted under the appropriate heading in Table B.4-10.

Table B.4-10 indicates that 30 percent of the documented damage incidents occurred to flora, with the remaining incidents occurring to drinking water (28 percent), fauna (23 percent) and property (11 percent). Documented damage to human health and food chain represented the remaining 8 percent of the incidents recorded.

Table B.4-10 indicates that of the 151 sites evaluated, 18 sites (12 percent) indicated high environmental damage, 15 sites (10 percent) indicated medium environmental damage and 61 sites (40 percent) indicated low environmental damage. The remaining 57 site files indicated no apparent damage (5 percent) or did not have enough information available (33 percent) to make an evaluation. Of note, are the files associated with the 34 sites (23 percent) which suggested that the actual damage may be higher than the response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

The analysis also indicated that out of the 151 sites evaluated, one site indicated high human health damage, 6 sites (4 percent) indicated medium human health damage and 6 sites (4 percent) indicated low human health damage. The remaining 138 sites indicated no apparent damage (i.e., there was no data available on public health damages) (9 percent) or while there was some data, there was not enough information available to make an evaluation (83 percent). Of note, are the files associated with 15 sites (10 percent) which suggested that the actual human health damage may be higher than the severity response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

B.4.7.2 Tabulation of Number and Severity of Damage Incidents by Facility Type. Table B.4-11 summarizes the DISF responses indicating damage to each affected area by associated facility type. This analysis indicates that approximately 73 percent of the damage incidents were associated with storage facilities (38 percent), landfills (17 percent) or surface impoundments (18 percent). The remaining 27 percent of the damage incidents were associated with open dumps, incinerators, recycling/reclamation, and 2 other categories.

Table B.4-11 also indicates that 75 percent of the incidents involving damage to drinking water involved landfills (19 percent), containers and tanks (34 percent) and surface impoundments (22 percent). Table B.4-11 also identifies the severity of damage to environment and/or human health. Landfills, storage facilities and surface impoundments resulted in 73 percent of the cases involving high or medium environmental damage and 71 percent of the cases involving high or medium human health damage.

B.4.8 Status of Response. Table B.4-12 summarizes the status of each site evaluated from the standpoint of enforcement, investigative and remedial activites. This table indicates that only 22 percent of the files

Table B.4-10

USEPA REGION IV
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY OF DAMAGE INCIDENTS

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	13	32	12	15	79	151
Food Chain	3	7	0	18	123	151
Flora	14	19	0	14	108	151
Fauna	11	16	0	16	108	151
Human Health	1	29	0	18	103	151
Property Damage	5	5	0	17	124	151

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	18	15	61	50	7	151
Human Health	1	6	6	125	13	151

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.4-11
USEPA REGION IV
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[1]

TABULATION OF NUMBER & SEVERITY DAMAGE INCIDENTS BY FACILITY TYPE

Landfill

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	7	9	6	4	24	50
Food Chain	1	2	0	8	39	50
Flora	6	6	0	6	32	50
Fauna	3	5	0	8	34	50
Human Health	0	9	0	7	34	50
Property Damage	3	2	0	7	38	50

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	7	4	23	16	0	50
Human Health	1	3	0	44	2	50

Open Dump

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	3	1	4	12	20
Food Chain	1	1	0	4	14	20
Flora	2	0	0	5	13	20
Fauna	2	2	0	5	11	20
Human Health	0	2	0	4	14	20
Property Damage	1	0	0	5	14	20

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	2	6	10	1	20
Human Health	0	0	0	18	2	20

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(1) Sampled sites were not randomly selected. Site selections criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.4-11 (cont'd)(1)

Surface Impoundments

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	5	14	3	2	20	44
Food Chain	1	3	0	3	37	44
Flora	6	5	0	3	30	44
Fauna	6	5	0	2	31	44
Human Health	0	7	0	4	33	44
Property Damage	1	3	0	3	37	44

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	7	9	13	15	0	44
Human Health	1	1	2	40	0	44

Incinerator

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	2	3	0	3	7	15
Food Chain	0	0	0	3	12	15
Flora	2	1	0	3	9	15
Fauna	0	1	0	3	11	15
Human Health	0	9	0	3	3	15
Property Damage	2	2	0	3	8	15

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	1	9	1	3	15
Human Health	1	1	2	8	3	15

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.4-11 (cont'd)(1)

Injection Well

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	1	0	1	2
Food Chain	0	0	0	0	2	2
Flora	0	0	0	0	2	2
Fauna	0	0	0	0	2	2
Human Health	0	0	0	0	2	2
Property Damage	0	0	0	0	2	2

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	1	0	0	2
Human Health	0	0	1	1	0	2

Land Treatment

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	1	0	0	4	5
Food Chain	0	0	0	0	5	5
Flora	1	1	0	0	3	5
Fauna	0	1	0	0	4	5
Human Health	0	0	0	0	5	5
Property Damage	0	0	0	0	5	5

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	2	3	0	0	5
Human Health	0	0	0	5	0	5

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.4-11 (cont'd)(1)

Transportation Spill Site(2)

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water						0
Food Chain						0
Flora						0
Fauna						0
Human Health						0
Property Damage						0

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						0
Human Health						0

Storage Treatment Containers

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	7	12	3	9	43	74
Food Chain	1	4	0	8	61	74
Flora	6	7	0	6	55	74
Fauna	4	6	0	5	59	74
Human Health	1	21	0	7	45	74
Property Damage	3	4	0	7	60	74

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	10	4	31	25	4	74
Human Health	0	4	5	56	9	74

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.4-11 (cont'd)(1)

Storage Treatment Tanks

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	2	8	1	0	23	34
Food Chain	0	1	0	1	32	34
Flora	4	4	0	1	25	34
Fauna	0	4	0	1	29	34
Human Health	0	10	0	0	24	34
Property Damage	0	2	0	0	32	34

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	4	3	13	13	1	34
Human Health	0	0	3	30	1	34

Storage Treatment Piles

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	2	0	1	0	3	6
Food Chain	0	0	0	0	6	6
Flora	2	1	0	0	4	6
Fauna	0	2	0	0	6	6
Human Health	0	1	0	0	5	6
Property Damage	1	0	0	0	5	6

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	5	0	0	6
Human Health	0	0	1	5	0	6

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.4-11 (cont'd)(1)

Boilers Using Waste as Fuel(2)

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

Recycling/Reclamation

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	1	3	1	2	7	14
Food Chain	0	2	0	1	11	14
Flora	1	3	0	1	9	14
Fauna	1	2	0	1	10	14
Human Health	1	5	0	2	6	14
Property Damage	0	3	0	1	10	14

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	2	7	1	2	14
Human Health	0	2	0	9	3	14

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.4-11 (cont'd)(1)

Midnight Dump

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	2	4	0	2	7	15
Food Chain	1	1	0	2	11	15
Flora	1	3	0	2	9	15
Fauna	1	1	0	3	10	15
Human Health	0	4	0	4	7	15
Property Damage	1	1	0	3	10	15

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	3	4	5	1	15
Human Health	0	0	2	12	1	15

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.4-12

USEPA REGION IV
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[1]

STATUS OF RESPONSE

Total Number of Sites...

...evaluated	...with legal/ enforcement action underway/completed	...with investigative actions underway/completed	...with remedial actions underway/completed
151	33	55	54

DESCRIPTION OF REMEDIAL ACTIVITY

Damage Incident	Facility type	Location	Remedial Activity	Costs ($)
1. Leaking drums	ST	Columbia, SC	NA	300,000
2. Suspected leaking drums	STC	Rock Hill, SC	NA	50,000*
3. Leaks and surface runoff; emission of toxic gases	STC	Columbia, SC	NA	975,000*
4. Possible leaking materials from drums	STC	Wellford, SC	In August 1980, EPA funded removal of 98 of the drums	45,000
5. Leaking and leaching of materials from transformers and surface impoundments	SI	Jacksonville, FL	A comprehensive cleanup plan is being developed for the site by EPA and the Florida Department of Environmental Regulation. In addition, remedial activities included the development of intercepter ditches and oil separaters	319,000

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.4-12 (cont'd)(1)

DESCRIPTION OF REMEDIAL ACTIVITY

Damage Incident	Facility type	Location	Remedial Activity	Costs ($)
6. Apparent rupture of levels from rainfall; leaching	SI	White House, FL	City of Jacksonville treated and dewatered the oil pits. Pits were filled and packed with clays	100,000
7. Contents of 200-300 drums spilled in a residential neighborhood	MD	Charlotte NC	Drums were removed	10,000
8. Leachate caused contamination to nearby private drinking water wells	LF	Wilmington, NC	Abandon existing wells and distribute water from a new public water supply well to local residents	300/ household

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NOTES: NA = Not Available
* = Estimate

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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evaluated indicated that the sites identified were involved in either past or present legal or enforcement actions. However, 55 (36 percent) site files indicated that additional environmental investigations were in progress or completed. Fifty-four (36 percent) sites were reported to be involved with past or present remedial activities.

Table B.4-12 also compares the damage incident type with the remedial activities and related costs for sites having cost data available. These activities included removal of wastes, lining of impoundments with clay and the development of cleanup plans. Expenditures for remedial activities for the sites ranged from $10,000 to $975,000.

Section B.5

B.5 Region V Summary

B.5.1 Region V Overview. The study team evaluated and completed DISFs for 117 sites in Region V. Many of these sites contained multiple facilities. A total of 212 facility types were used in describing the sites in this region. Of the 212 facility types evaluated, 29 percent were containers, 19 percent were tanks, 14 percent were landfills and 11 percent were surface impoundments. The remaining 27 percent of the facility types were described by various other categories. As discussed in Sections 3.1 and 3.2, the reader should note for the following discussion that the data bases and the selection criteria utilized on this study limit the applicability of the conclusion reached herein to other populations of hazardous waste sites.

Contamination, either documented or suspected, was identified in at least 76 sites, or 65 percent of the sites evaluated. At 13 of the sites, or 11 percent, contamination was documented. Thirty-three percent of the contamination incidents occurred to soil, with the remaining incidents occurring to surface water (30 percent), groundwater (27 percent) and air (10 percent). Of the 181 responses originally indicating contamination, only 23 (13 percent) could be documented using the evaluation criteria developed in Section 3.1.4. Each site was evaluated for damage occurring to life, property and various natural resources. This evaluation focused on six potentially affected areas, including drinking water, food chain, flora, fauna, human health and property. Damage, (either documented or suspected), was identified in at least 39 sites, or 33 percent of the sites evaluated. Of the 79 affected areas originally indicating damage only 20 (25 percent) could be documented using the evaluation criteria. Approximately 30 percent of the documented damage incidents occurred to drinking water, with the remaining incidents occurring to flora (30 percent), human health (20 percent), property damage (15 percent) and fauna (5 percent). There were four incidents involving documented damage to human health. Sixty-four percent of the incidents causing the damage or contamination described above were due to spills (26 percent), leachate (21 percent) or leaks (17 percent). These incidents involved contamination caused by volatile halogenated organics, volatile nonhalogenated organics, base neutral extracables, acid compounds or metals in 67 percent of the incidents tabulated.

B.5.2 Sources. The study team preliminarily identified 145 potential files in Region V for review. File sources included 133 FIT Files, 4 S&A Files, and 8 enforcement files. Five files were not reviewed because the FIT team had negotiated a confidentiality agreement with the site owners. Based upon a review of the remaining 140 sites, 13 were eliminated from the study because they did not conform to the Selection Criteria summarized in Section 3.1, Table 3-1.

B.5.3 Tabulation of Site Descriptions by Facility Type. Each site was evaluated and categorized by one or more of the following fourteen site descriptions as listed in Section IIA of the DISFs.

- Landfill Facility
- Open Dump
- Surface Impoundment
- Incinerator
- Storage/Treatment Containers
- Storage/Treatment Tanks
- Storage/Treatment Piles
- Boilers Using Waste as Fuel

- Injection Well
- Land Treatment
- Transportation Spill Site
- Recycling/Reclamation
- Midnight Dump
- Other

For the 117 sites evaluated in the region, 10 of these categories were identified at least once, along with an additional 3 "other" categories not listed in the DISF. These other categories included wastewater discharges, a creek and an auto parts removal shop. Table B.5-1 summarizes the total number of facility types used in describing the 117 sites evaluated. Many of these sites contained multiple facilities. A total of 212 facility types were used in describing the sites in this region. Of the 212 facility types evaluated, approximately 77 percent of the sites were identified as either containers (29 percent), tanks (19 percent), landfills (14 percent), surface impoundments (11 percent) or midnight dumps (4 percent). A total of 48 sites were described by 2 or more facility types and 24 sites by three or more facility types.

B.5.4 Contamination Incidents. Four media, i.e. groundwater, surface water, air and soil, were evaluated for site-related contamination in Section V of the DISF. In the remainder of this section, contamination will be interpreted to mean both documented and suspected incidents/events, unless otherwise noted. Sites indicating the absence of contamination, and/or files not containing sufficient information to determine the presence of contamination, were also identified. Table B.5-2 summarizes the number of sites identified.

Contamination incidents were identified at 76 of the sites evaluated. A total of 181 incidents involving various media were recorded at these sites of which 23 (13 percent) could be documented by sampling and analytical data. Fifty-three sites were identified with contamination in two or more media. For example, of the 59 sites indicating soil contamination, 34 sites also indicated groundwater contamination. File data indicated that 74 sites were contaminated from incident(s) occurring at the site evaluated. File data for the two remaining sites indicated that contamination may have originated off-site.

B.5.4.1 Tabulation of Media Exposed to Contamination. Table B.5-3 summarizes the total number of DISF responses indicating contamination or the absence of contamination found by media. Site files not containing sufficient information to determine contamination were also recorded for each of the media evaluated and noted under the appropriate heading in Table B.5-3. This table indicates that 33 percent of the contamination incidents occurred to soil. The remaining incidents occurred to either surface water (30 percent), groundwater (27 percent) or air (10 percent). In many cases, contamination to more than one media occurred at any particular site.

B.5.4.2 Tabulation of Media Exposed to Contamination Incidents by Facility Type. Table B.5-4 summarizes the total number of DISF responses indicating media contamination associated with each facility type. This analysis suggests that approximately 81 percent of the sites associated with contamination incidents were identified as either containers (26 percent),

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Table B.5-1

USEPA REGION V
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITE DESCRIPTION BY TYPE

Facilty Type	Total Number of Responses Described as Given Facility Type	Percent of Total
Landfill Facility	30	14
Open Dump	12	6
Surface Impoundment	23	11
Incinerator	8	4
Injection Well	0	0
Land Treatment	2	1
Transportation Spill Site	0	0
Storage/Treatment Containers	63	29
Storage/Treatment Tanks	40	19
Storage/Treatment Piles	8	4
Boilers Using Waste Fuel	0	0
Recycling/Reclamation	15	7
Midnight Dump	8	4
Other	3	1
Total	212	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.3.1 and 3.2.1.

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Table B.5-2

USEPA REGION V
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES EXPOSED TO CONTAMINATION INCIDENTS

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented contamination (to at least one medium)	13	11
2	Sites indicating suspected contamination (to at least one medium) and not identified by Category 1 above	63	54
3	Sites indicating documented or suspected absence of contamination and not identified by Categories 1 and 2 above	30	26
4	Sites for which there was an absence of sufficient information in the file to make a determination of contamination, and not identified by Categories 1, 2 or 3 above	11	10
TOTAL SITES		117	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.5-3

USEPA REGION V
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[1]

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT

Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
	Documented	Suspected	Documented	Suspected		
Groundwater	6	43	2	55	11	117
Surface Water	10	45	2	49	11	117
Air	0	18	1	88	10	117
Soil	7	52	0	47	11	117

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.5-4

USEPA REGION V
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT BY FACILITY TYPE

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Landfill	Groundwater	3	18	1	6	2	30
	Surface Water	5	10	1	12	2	30
	Air	0	4	1	13	2	30
	Soil	3	10	0	15	2	30
Open Dump	Groundwater	0	7	1	2	2	12
	Surface Water	3	7	0	0	2	12
	Air	0	1	0	9	2	12
	Soil	2	7	0	1	2	12
Surface Impoundment	Groundwater	0	13	1	7	2	23
	Surface Water	1	14	1	5	2	23
	Air	0	5	0	16	2	23
	Soil	0	12	0	9	2	23
Incinerator	Groundwater	0	0	0	8	0	8
	Surface Water	0	0	0	8	0	8
	Air	0	3	0	5	0	8
	Soil	0	0	0	8	0	8

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.5-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Injection Well(2)	Groundwater	0	0	0	0	0	0
	Surface Water	0	0	0	0	0	0
	Air	0	0	0	0	0	0
	Soil	0	0	0	0	0	0
Land Treatment	Groundwater	0	1	0	1	0	2
	Surface Water	0	1	0	1	0	2
	Air	0	0	0	2	0	2
	Soil	0	2	0	0	0	2
Transportation Spill Site(2)	Groundwater	0	0	0	0	0	0
	Surface Water	0	0	0	0	0	0
	Air	0	0	0	0	0	0
	Soil	0	0	0	0	0	0
Storage Treatment Containers	Groundwater	2	20	1	33	7	63
	Surface Water	4	18	2	32	7	63
	Air	0	5	0	50	8	63
	Soil	4	24	0	27	8	63
Storage Treatment Tanks	Groundwater	3	9	0	21	7	40
	Surface Water	2	14	0	17	7	40
	Air	0	5	0	28	7	40
	Soil	1	18	0	14	7	40

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table 3.6-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Storage Treatment Piles	Groundwater	1	3	0	3	0	7
	Surface Water	1	4	0	2	0	7
	Air	0	2	0	5	0	7
	Soil	2	2	0	3	0	7
Boilers Using Waste as Fuel(2)	Groundwater	0	0	0	0	0	0
	Surface Water	0	0	0	0	0	0
	Air	0	0	0	0	0	0
	Soil	0	0	0	0	0	0
Recycling Reclamation	Groundwater	0	3	0	8	4	15
	Surface Water	0	1	1	10	3	15
	Air	0	2	0	12	1	15
	Soil	0	2	0	9	4	15
Midnight Dump	Groundwater	0	5	0	1	2	8
	Surface Water	1	3	0	0	4	8
	Air	0	2	1	0	5	8
	Soil	0	5	0	0	3	8

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

landfills (18 percent), tanks (17 percent), surface impoundments (15 percent) or midnight dumps (5 percent). Table B.5-4 indicates that, for most of the incidents tabulated, in decreasing order of occurrence, contamination to:

- groundwater was associated with containers, landfills, surface impoundment, tanks, and open dumps;
- surface water was associated with tanks, containers, surface impoundments, and landfills;
- soil was associated with containers, tanks, landfills, surface impoundments, and open dumps; and
- air was associated with containers, surface impoundments, tanks, landfills and incinerators.

B.5.5 Events Causing Contamination. Contaminated sites were associated with one or more of the following events, as outlined in Section VIII of the DISF.

- Fire/Explosion
- Spill
- Leak
- Flood
- Seismic Activity
- Erosion
- Leachate
- Emission of Toxic Gases/Mists

In the remainder of this section, events tabulated will include both documented and suspected events, unless otherwise noted.

Seven of these events were identified at least once, along with three other types not listed in the DISF. The other events were described as a surface runoff, wastewater discharge and fugitive dust. A total of 45 sites (38 percent) were involved in two events and 19 sites (16 percent) in three or more events.

B.5.5.1 Tabulation of Events Causing Contamination Incidents. Table B.5-5 summarizes the total number of events causing contamination incidents. In total, 142 contamination events involving various facility types were recorded in the DISFs. For this region, this tabulation indicates that approximately 64 percent of the contamination events were related to spills (26 percent), leachate (21 percent) or leaks (17 percent). Of the 142 contamination events tabulated, 29 (20 percent) could be documented from information available in the file.

B.5.5.2 Tabulation of Events Causing Contamination Incidents By Facility Type. Table B.5-6 summarizes the events causing contamination incidents at various facility types. Since a number of sites contained a multiple number of facilities, there were a number of cases where there was insufficient information available in the file to identify the damage incident with the specific facility unit in question. These represented approximately 3 percent of the total and are identified in Table B.5-6.

Table B.5-5

USEPA REGION V
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS

Event	Documented	Suspected	Total
Fire/Explosion	5	8	13
Spills	5	32	37
Leaks	3	21	24
Flood	0	3	3
Seismic Activity	0	0	0
Erosion	5	10	15
Leachate	6	24	30
Emission of Toxic Gases/Mists	0	6	6
Other	5	9	14
Total	29	113	142

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.5-6

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS BY FACILITY TYPE

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Landfill	Fire/Explosion	0	3	0	3
	Spills	0	2	0	2
	Leaks	0	2	0	2
	Flood	0	3	0	3
	Seismic Activity	0	0	0	0
	Erosion	2	4	0	6
	Leachate	2	14	0	16
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	2	0	2
Open Dump	Fire/Explosion	0	1	1	2
	Spills	2	2	0	4
	Leaks	1	1	0	2
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	1	1	0	2
	Leachate	0	4	0	4
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	0	1	0	1
Surface Impoundments	Fire/Explosion	0	0	0	0
	Spills	0	3	0	3
	Leaks	1	4	0	5
	Flood	0	1	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	2	0	2
	Leachate	1	3	0	4
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	2	1	0	3

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.5-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Incinerator	Fire/Explosion	0	0	0	0
	Spills	0	1	0	1
	Leaks	0	1	0	1
	Flood	0	1	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	0	2	0	2
Injection Well (2)	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Land Treatment	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	1	1	2
	Leachate	0	2	2	4
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Transportation Spill Site (2)	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.5-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Storage Treatment Containers	Fire/Explosion	2	4	1	7
	Spills	1	20	1	22
	Leaks	0	17	1	18
	Flood	0	0	1	1
	Seismic Activity	0	0	0	0
	Erosion	0	4	1	5
	Leachate	0	2	1	3
	Emission of Toxic Gases/Mists	0	4	1	5
	Other	2	1	1	4
Storage Treatment Tanks	Fire/Explosion	1	4	0	5
	Spills	1	15	0	16
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	1	0	0	1
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Storage Treatment Piles	Fire/Explosion	0	0	0	0
	Spills	1	0	0	1
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	1	0	0	1
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Boilers Using Waste as Fuel(2)	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

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Table B.5-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Recycling Reclamation	Fire/Explosion	0	2	0	2
	Spills	0	1	0	1
	Leaks	0	2	0	2
	Flood	0	1	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	1	1	0	2
Midnight Dump	Fire/Explosion	0	0	3	3
	Spills	0	0	3	3
	Leaks	0	0	3	3
	Flood	1	0	1	2
	Seismic Activity	0	0	1	1
	Erosion	1	0	2	3
	Leachate	1	1	2	4
	Emission of Toxic Gases/Mists	0	0	1	1
	Other	0	0	1	1

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

This analysis indicates that approximately 79 percent of the leachate events were associated with landfills (53 percent), open dumps (13 percent) or surface impoundments (13 percent). Leaks were found to occur primarily at container storage facilities. Approximately 79 percent of the spill events were associated with storage or treatment facilities (all types) (64 percent) and surface impoundments (15 percent). Air pollution events, i.e., emissions of toxic gases and mists, were most commonly associated with containers (50 percent) and incinerators (13 percent). Facilities having the highest frequency of fires and explosions were containers (35 percent) and tanks (29 percent) and recycling/reclamation facilities (12 percent).

B.5.6 Chemicals Documented in Contamination Incidents. For this analysis, chemical compounds were organized into the following general categories:

- Volatile Halogenated Organics (VHOs)
- Volatile Non-halogenated Organics (VNHOs)
- Base Neutral Extractables (BNEs)
- Pesticides
- PCBs
- Metals
- Oil
- Ammonia/Ammonia Compounds
- Asbestos
- Inorganics
- Cyanide
- Acids
- Acid Compounds
- Alkalies
- Alcohols
- Aldehydes
- Ketones
- Radioactive

Table B.5-7 summarizes the total number of times that a chemical in a given category was positively identified by sampling and analytical techniques as occurring as contaminants in the various media.

Thirteen of these chemical categories were identified at least once. This tabulation indicates that approximately 75 percent of the chemical categories were identified as either VHOs (19 percent), metals (17 percent), acid compounds (12 percent), VNHOs (9 percent) and BNEs (9 percent) and inorganics (9 percent). Table B.5-8 lists the most commonly occurring chemicals found in each of these categories, and the range of concentrations observed in the affected media.

B.5.7 Damage Incidents. The following six affected areas were evaluated for site related damage on the DISF.

- Drinking Water
- Food Chain
- Flora
- Fauna
- Human Health
- Property Damage

In the remainder of this section damage will be interpreted to mean both documented and suspected incidents/events unless otherwise noted.

Damage was identified for at least 39 sites, or 33 percent, of the sites evaluated. As noted in Section B.5.4, higher percentages of the sites indicated contamination (65 percent). Damage was indicated in approximately 51 percent of the contaminated sites evaluated. Of the 79 affected areas indicating damage, only 20 (25 percent) could be documented using the evaluation criteria.

Table B.5-7

USEPA REGION V
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF CHEMICALS DOCUMENTED IN CONTAMINATION INCIDENTS

Chemical Category	Total Positive Identifications	Percent of Total
Volatile Halogenated Organics (VHOs)	8	19
Volatile Non-halogenated Organics (VNHOs)	4	9
Base Neutral Extractables (BNEs)	4	9
Pesticides	2	5
PCBs	2	5
Metals	7	17
Oil	2	5
Ammonia/Ammonia Compounds	1	2
Inorganics	4	9
Cyanide	1	2
Acids	1	2
Acid Compounds	5	12
Alkalies	1	2
Alcohols	0	0
Aldehydes	0	0
Ketones	0	0
Radioactive	0	0
Asbestos	0	0
Others	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.5-8

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

CONCENTRATION OF SELECTED CONTAMINANTS IDENTIFIED BY MEDIA

Most Frequently Observed Chemical Category	Contaminant	Contaminant Concentration Range			
		Groundwater (mg/l)	Surface Water (mg/l)	Soil (mg/kg)	Air (mg/l)
VHOs	1,1,1 trichloroethane	ND	0.030	ND	ND
	dichloromethane	0.230-19.0	210-250	0.034	ND
VNHOs	benzene	23-80	Trace	Trace	ND
	toluene	ND	6.572	ND	ND
Metals	lead	ND	trace-40	ND	ND
	manganese	ND-1.20	64-8900	ND	ND
	chromium	ND	ND-10	ND	ND
	arsenic	0.021	ND	0.018-0.070	ND
Acid Compounds	phenol	ND	0.011-	6.920	ND
PCBs		9	0.038	ND	ND

NOTES:

ND = no data available

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Sites indicating the absence of damage, and/or files not containing sufficient information to determine damage, were also identified. A tabulation of sites identified with damage for at least one of the above categories is outlined in Table B.5-9. Of note, are the 20 sites (17 percent) identified as having damage to two or more affected areas. Of the 59 sites indicating soil contamination, 13 sites also indicated damage to drinking water. Also, of the 66 sites indicating soil and/or surface water contamination, 18 sites also indicated damage to flora, fauna or the food chain.

B.5.7.1 Tabulation of Number, Type and Severity of Damage Incidents. Table B.5-10 summarizes the total number of DISF responses indicating damage to the above affected areas. Site files not containing sufficient information to determine damage were also recorded and noted under the appropriate heading in Table B.5-10.

Table B.5-10 indicates that 30 percent of the documented damage incidents occurred to drinking water, with the remaining incidents occurring to flora (30 percent), human health (20 percent), property damage (15 percent) and fauna (5 percent). Documented damage to food chain was not observed.

Table B.5-10 indicates that of the 117 sites evaluated, 5 sites (4 percent) indicated high environmental damage, 15 sites (13 percent) indicated medium environmental damage and 46 sites (39 percent) indicated low environmental damage. The remaining 51 site files indicated no apparent damage (37 percent) or did not have enough information available (7 percent) to make an evaluation. Of note, are the files associated with the 15 sites (13 percent) which suggested that the actual damage may be higher than the response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

The analysis also indicated that out of the 117 sites evaluated, 2 sites indicated high human health damage (2 percent), 6 sites (5 percent) indicated medium human health damage and 8 sites (7 percent) indicated low human health damage. The remaining 101 sites indicated no apparent damage (i.e., there was no data available on public health damages) (79 percent) or while there was some data, there was not enough information available to make an evaluation (8 percent). Of note, are the files associated with 30 sites (26 percent) which suggested that the actual human health damage may be higher than the severity response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

B.5.7.2 Tabulation of Number and Severity of Damage Incidents by Facility Type. Table B.5-11 summarizes the DISF responses indicating damage to each affected area by associated facility type. This analysis indicates that approximately 88 percent of the damage incidents were associated with storage facilities (52 percent), landfills (22 percent) or surface impoundments (14 percent). The remaining 12 percent of the damage incidents were associated with open dumps, incinerators, recycling/reclamation, and 4 other categories.

Table B.5-11 also indicates that 79 percent of the incidents involving damage to drinking water involved, containers and tanks (41 percent), landfills (25 percent) and surface impoundments (12 percent). Landfills,

Table B.5-9

USEPA REGION I
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES DAMAGED

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented damage (to at least one affected area)	8	7
2	Sites indicating suspected damage (to at least one affected area) and not identified by Category 1 above	31	27
3	Sites indicating documented or suspected absence of damage and not identified by Categories 1 and 2 above	64	54
4	Sites for which there was an absence of sufficient information in the file to make a determination of damage and not identified by Categories 1,2 and 3 above	14	12
	TOTAL SITES	117	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.5-10

USEPA REGION V
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY OF DAMAGE INCIDENTS

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	6	17	1	79	14	117
Food Chain	0	3	0	100	14	117
Flora	6	15	0	82	14	117
Fauna	1	9	1	92	14	117
Human Health	4	13	0	83	14	117
Property Damage	3	2	0	98	14	117

Affected Area	Severity of Damage			Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
	High	Medium	Low			
Environmental	5	15	46	8	47	117
Human Health	2	6	8	9	92	117

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.5-11

USEPA REGION V
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY DAMAGE INCIDENTS BY FACILITY TYPE

Landfill

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	7	0	17	6	30
Food Chain	0	1	0	24	5	30
Flora	0	1	0	24	5	30
Fauna	0	1	0	24	5	30
Human Health	0	4	0	21	5	30
Property Damage	0	1	0	25	4	30

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	3	5	10	2	10	30
Human Health	0	2	2	3	23	30

Open Dump

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	4	0	6	2	12
Food Chain	0	0	0	11	1	12
Flora	0	0	0	10	2	12
Fauna	0	0	0	10	2	12
Human Health	0	2	0	8	2	12
Property Damage	0	0	0	10	2	12

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	5	5	1	1	12
Human Health	0	1	0	1	10	12

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

97%

(251) 251

Table B.5-11 (cont'd)(1)

Surface Impoundments

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	1	3	0	15	4	23
Food Chain	0	1	0	18	4	23
Flora	1	4	0	14	4	23
Fauna	0	4	1	14	4	23
Human Health	0	2	0	17	4	23
Property Damage	0	1	0	18	4	23

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	4	11	1	5	23
Human Health	0	2	3	2	16	23

Incinerator

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	5	3	8
Food Chain	0	0	0	5	3	8
Flora	0	0	0	5	3	8
Fauna	0	0	0	5	3	8
Human Health	1	0	0	4	3	8
Property Damage	0	0	0	5	3	8

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	1	3	3	1	8
Human Health	0	1	0	3	4	8

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.5-11 (cont'd)(1)

Injection Well(2)

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	0	0	0
Food Chain	0	0	0	0	0	0
Flora	0	0	0	0	0	0
Fauna	0	0	0	0	0	0
Human Health	0	0	0	0	0	0
Property Damage	0	0	0	0	0	0

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	0	0	0
Human Health	0	0	0	0	0	0

Land Treatment

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	2	0	2
Food Chain	0	0	0	2	0	2
Flora	0	0	0	2	0	2
Fauna	0	0	0	2	0	2
Human Health	0	0	0	2	0	2
Property Damage	0	0	0	2	0	2

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	1	0	0	1	2
Human Health	0	0	0	0	2	2

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

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Table B.5-11 (cont'd)(1)

Transportation Spill Site(2)

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	0	0	0
Food Chain	0	0	0	0	0	0
Flora	0	0	0	0	0	0
Fauna	0	0	0	0	0	0
Human Health	0	0	0	0	0	0
Property Damage	0	0	0	0	0	0

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	0	0	0
Human Health	0	0	0	0	0	0

Storage Treatment Containers

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	1	6	0	48	8	63
Food Chain	0	0	0	55	8	63
Flora	1	3	0	51	8	63
Fauna	0	1	1	53	8	63
Human Health	0	6	0	49	8	63
Property Damage	0	0	0	55	8	63

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	4	25	4	29	63
Human Health	0	1	4	7	51	63

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

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Table B.5-11 (cont'd)(1)

Storage Treatment Tanks

	Damage		No Damage		Insufficient Information Available	
Affected Area	Documented	Suspected	Documented	Suspected	in File	Total
Drinking Water	2	4	1	27	6	40
Food Chain	0	1	0	33	6	40
Flora	3	3	0	22	6	40
Fauna	1	2	0	31	6	40
Human Health	2	3	1	28	6	40
Property Damage	0	0	0	34	6	40

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	4	10	3	21	40
Human Health	2	1	4	3	30	40

Storage Treatment Piles

	Damage		No Damage		Insufficient Information Available	
Affected Area	Documented	Suspected	Documented	Suspected	in File	Total
Drinking Water	1	1	0	6	0	8
Food Chain	0	0	0	8	0	8
Flora	1	1	0	6	0	8
Fauna	0	1	0	7	0	8
Human Health	1	2	0	5	0	8
Property Damage	0	0	0	8	0	8

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	3	3	0	1	8
Human Health	0	2	1	0	5	8

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.5-11 (cont'd)(1)

Boilers Using Waste as Fuel(2)

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	0	0	0
Food Chain	0	0	0	0	0	0
Flora	0	0	0	0	0	0
Fauna	0	0	0	0	0	0
Human Health	0	0	0	0	0	0
Property Damage	0	0	0	0	0	0

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	0	0	0
Human Health	0	0	0	0	0	0

Recycling/Reclamation

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	12	3	15
Food Chain	0	0	0	12	3	15
Flora	0	1	0	11	3	15
Fauna	0	0	0	12	3	15
Human Health	0	0	0	12	3	15
Property Damage	0	0	0	13	2	15

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	0	3	1	9	15
Human Health	0	0	2	1	12	15

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.
(2) Facility type not identified in files evaluated.

Table B.5-11 (cont'd)(1)

Midnight Dump

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	1	0	1	5	1	8
Food Chain	0	0	1	7	0	8
Flora	0	1	0	7	0	8
Fauna	0	1	0	7	0	8
Human Health	2	1	0	4	1	8
Property Damage	0	0	1	7	0	8

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	4	2	0	2	8
Human Health	2	2	0	0	4	8

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

storage facilities and surface impoundments resulted in 69 percent of the cases involving high or medium environmental damage and 63 percent of the cases involving high or medium human health damage.

B.5.8 Status of Response. Table B.5-12 summarizes the status of each site evaluated from the standpoint of enforcement, investigative and remedial activites. This table indicates that only 10 percent of the files evaluated indicated that the sites identified were involved in either past or present legal or enforcement actions. However, 90 (77 percent) site files indicated that additional environmental investigations were in progress or completed. Fifteen (13 percent) sites were reported to be involved with past or present remedial activities.

Table B.5-12

USEPA REGION V
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

STATUS OF RESPONSE

Total Number of Sites...

...evaluated	...with legal/ enforcement action underway/completed	...with investigative actions underway/completed	...with remedial actions underway/completed
117	12	90	15

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Section B.6

B.6 Region VI Summary

B.6 Region VI Overview. The study team evaluated and completed DISFs for 97 sites in Region VI. Many of these sites contained multiple facilities. A total of 210 facility types were used in describing the sites in this region. Of the 210 facility types evaluated, 28 percent were surface impoundments, 16 percent were containers, 15 percent were tanks, 12 percent were landfills, 8 percent were recycling/reclamation facilities and 8 percent were piles. The remaining 13 percent of the facility types were described by various other categories. As discussed in Sections 3.1 and 3.2 the reader should note for the following discussion that the data bases and the selection criteria utilized on this study limit the applicability of the conclusions reached herein to other populations of hazardous waste sites.

Contamination, either documented or suspected, was identified in 96 percent of the sites evaluated. At 78 of the sites, or 81 percent, contamination was documented. Thirty-three percent of the contamination incidents occurred to surface water, with the remaining incidents occurring to soil (31 percent), groundwater (29 percent) and air (7 percent). Of the 269 responses originally indicating contamination, only 135 (50 percent) could be documented using the evaluation criteria developed in Section 3.1.4. Each site was evaluated for damage occurring to life, property and various natural resources. This evaluation focused on six potentially affected areas, including drinking water, food chain, flora, fauna, human health and property. Damage, (either documented or suspected), was identified in at least 61 sites, or 63 percent of the sites evaluated. Of the 127 affected areas originally indicating damage, only 27 (21 percent) could be documented using the evaluation criteria. Approximately 60 percent of the documented damage incidents occurred to drinking water, with the remaining incidents occurring to fauna (18 percent), and food chain and human health (7 percent each) and property and flora (4 percent each). There were two incidents involving documented damage to human health. One incident involved a tank car facility which killed three workers. Eighty-six percent of the incidents causing the damage or contamination described above were due to leaks (25 percent), leachate (24 percent), spills (21 percent), or floods and explosions (8 percent each). These incidents involved contamination caused by metals, acid compounds, base neutral extractables, pesticides or volatile halogenated organics in 70 percent of the incidents tabulated.

B.6.2 Sources. The study team preliminarily identified 120 files in Region VI for review. File sources included 120 FIT Files. One file was not reviewed because the FIT team had negotiated a confidentiality agreement with the site owners. Based upon a review of the remaining 119 sites, 22 were eliminated from the study because they did not conform to the Selection Criteria summarized in Section 3.1, Table 3.-1.

B.6.3 Tabulation of Site Descriptions by Facility Type. Each site was evaluated and categorized by one or more of the following fourteen site descriptions as listed in Section IIA of the DISFs.

- Landfill Facility
- Open Dump
- Surface Impoundment
- Incinerator
- Injection Well
- Land Treatment
- Transportation Spill Site
- Storage/Treatment Containers
- Storage/Treatment Tanks
- Storage/Treatment Piles
- Boilers Using Waste as Fuel
- Recycling/Reclamation
- Midnight Dump
- Other

For the 97 sites evaluated in the region, 12 of these categories were identified at least once, along with an additional 2 "other" categories not listed in the DISF. These other categories included waste transporters and abandoned mines. Table B.6-1 summarizes the total number of facility types in describing the 97 sites evaluated. Many of the sites contained multiple facilities. A total of 210 facility types were used in describing the sites in this region. Of the 210 facility types evaluated, approximately 87 percent of the facility types were identified as either surface impoundments (28 percent), containers (16 percent), tanks (15 percent), landfills (12 percent), reclamation/recycling facilities (8 percent) or piles (8 percent). A total of 62 sites were described by 2 or more facility types and 32 sites by three or more facility types.

B.6.4 Contamination Incidents. Four media, i.e. groundwater, surface water, air and soil, were evaluated for site-related contamination in Section V of the DISF. In the remainder of this section, contamination will be interpreted to mean both documented and suspected incidents/events, unless otherwise noted. Sites indicating the absence of contamination, and/or files not containing sufficient information to determine the presence of contamination, were also identified. Table B.6-2 summarizes the number of sites identified with contamination in at least one of the above media.

Contamination incidents were identified at 94 (96 percent) of the sites evaluated. A total of 269 incidents involving various media were recorded at these sites of which 135 (50 percent) could be documented by sampling and analytical data. Eighty-nine sites were identified with contamination in two or more media. For example, of the 83 sites indicating soil contamination, 69 sites also indicated groundwater contamination. File data indicated that 91 sites were contaminated from incident(s) occurring at the site evaluated. File data for the remaining sites indicated that contamination may have originated off-site.

B.6.4.1 Tabulation of Media Exposed to Contamination. Table B.6-3 summarizes the total number of DISF responses indicating contamination or the absence of contamination found by media. Site files not containing sufficient information to determine contamination were also recorded for each of the media evaluated and noted under the appropriate heading in Table B.6-3. This table indicates that 33 percent of the contamination incidents occurred to surface water. The remaining incidents occurred to either soil (31 percent), groundwater (29 percent) or air (7 percent). In many cases, contamination to more than one media occurred at any particular site.

B.6.4.2 Tabulation of Media Exposed to Contamination Incidents by Facility Type. Table B.6-4 summarizes the total number of DISF responses indicating media contamination associated with each facility type. This analysis suggests that approximately 80 percent of the sites associated with contamination incidents were identified as either surface impoundments (29 percent) containers (15 percent), tanks (14 percent), landfills (13 containers (8 percent), or piles (7 percent). Leaks were found to occur primarily at surface impoundments. Approximately 68 percent of the spill events were associated with surface impoundments (30 percent), containers (20 percent), and tanks (18 percent). Air pollution events, i.e., emissions of toxic

Table B.6-1

USEPA REGION VI
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITE DESCRIPTIONS BY TYPE

Facility Type	Total Number of Responses Described as Given Facility Type	Percent of Total
Landfill	26	12
Open Dump	9	4
Surface Impoundment	58	28
Incinerator	2	1
Injection Well	5	2
Land Treatment	1	1
Transportation Spill Site	2	1
Storage/Treatment Containers	35	16
Storage/Treatment Tanks	32	15
Storage/Treatment Piles	17	8
Recycling/Reclamation	16	8
Midnight Dump	5	2
Other	2	1
Total	210	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-2

USEPA REGION VI
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES EXPOSED TO CONTAMINATION INCIDENTS

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented contamination (to at least one medium)	78	81
2	Sites indicating suspected contamination (to at least one medium) and not identified by Category 1 above	16	16
3	Sites indicating absence of contamination and not identified by Categories 1 and 2 above	1	1
4	Sites for which there was an absence of sufficient information in the file to make a determination of contamination, and not identified by Categories 1, 2 or 3 above	2	2
	TOTAL SITES	96	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-3

USEPA REGION VI
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT

Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
	Documented	Suspected	Documented	Suspected		
Groundwater	38	39	0	12	8	97
Surface Water	34	54	1	6	2	97
Air	2	19	0	59	17	97
Soil	61	22	1	12	1	97

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.6-4

USEPA REGION VI
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[1]

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT BY FACILITY TYPE

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Landfill	Groundwater	7	16	0	2	1	26
	Surface Water	9	16	0	1	0	26
	Air	0	4	0	18	4	26
	Soil	12	12	0	1	1	26
Open Dump	Groundwater	2	5	0	1	1	9
	Surface Water	4	5	0	0	0	9
	Air	0	2	0	6	1	9
	Soil	4	4	0	1	0	9
Surface Impoundment	Groundwater	22	30	0	4	2	58
	Surface Water	23	35	0	0	0	58
	Air	0	12	0	35	11	58
	Soil	30	25	0	2	1	58
Incinerator	Groundwater	2	0	0	0	0	2
	Surface Water	1	1	0	0	0	2
	Air	0	2	0	0	0	2
	Soil	1	1	0	0	0	2

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Injection Well	Groundwater	1	2	0	1	1	5
	Surface Water	2	0	0	1	1	5
	Air	0	3	0	1	1	5
	Soil	1	2	0	1	1	5
Land Treatment	Groundwater	0	1	0	0	0	1
	Surface Water	0	1	0	0	0	1
	Air	0	0	0	1	0	1
	Soil	1	1	0	0	0	1
Transportation Spill Site	Groundwater	2	0	0	0	0	2
	Surface Water	1	1	1	0	0	2
	Air	0	1	0	1	0	2
	Soil	2	0	0	0	0	2
Storage Treatment Containers	Groundwater	9	18	0	4	4	35
	Surface Water	6	23	0	4	2	35
	Air	0	10	0	20	5	35
	Soil	13	13	0	7	2	35
Storage Treatment Tanks	Groundwater	9	14	0	6	3	32
	Surface Water	10	18	0	1	3	32
	Air	0	10	0	19	3	32
	Soil	13	12	0	4	3	32

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Storage Treatment Piles	Groundwater	3	8	0	2	4	17
	Surface Water	4	12	0	0	1	17
	Air	0	8	0	6	3	17
	Soil	10	6	0	0	1	17
Boilers Using Waste as Fuel	Groundwater						
	Surface Water						
	Air						
	Soil						
Recycling Reclamation	Groundwater	1	12	0	3	0	16
	Surface Water	1	14	0	1	0	16
	Air	0	6	0	9	1	16
	Soil	4	11	0	1	0	16
Midnight Dump	Groundwater	1	4	0	1	0	5
	Surface Water	0	3	0	1	1	5
	Air	0	0	0	3	2	5
	Soil	3	2	0	0	0	5

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

gases and mists, were most commonly associated with containers (21 percent), surface impoundments (21 percent), and tanks (21 percent), or piles (8 percent). Table B.6-4 indicates that, for most of the incidents tabulated, in decreasing order of occurrence, contamination to:

- groundwater was associated with surface impoundments, containers, landfills, tanks and recycling/reclamation facilities;
- surface water was associated with surface impoundments, containers, tanks, landfills and piles;
- soil was associated with surface impoundments, containers, tanks, landfills, and piles; and
- air was associated with surface impoundments, containers, tanks, piles and recycling/reclamation facilities.

B.6.5 Events Causing Contamination. Contaminated sites were associated with one or more of the following events, as outlined in Section VIII of the DISF.

- Fire/Explosion
- Spill
- Leak
- Flood
- Seismic Activity
- Erosion
- Leachate
- Emission of Toxic Gases/Mists

In the remainder of this section, events tabulated will include both documented and suspected events, unless otherwise noted.

All of these events were identified at least once, along with two other types not listed in the DISF. These events were described as wastewater discharge and surface runoff. A total of 20 sites (21 percent) were involved in two events and 60 sites (62 percent) in three or more events.

B.6.5.1 Tabulation of Events Causing Contamination Incidents. Table B.6-5 summarizes the total number of events causing contamination incidents. In total, 249 contamination events involving various facility types were recorded in the DISFs. For this region, this tabulation indicates that 86 percent of the contamination events were related to leaks (25 percent), leachate (24 percent), spills (21 percent), floods (8 percent) or fire/explosions (8 percent). Of the 259 contamination events tabulated, 55 (22 percent) could be documented from information available in the file.

B.6.5.2 Tabulation of Events Causing Contamination Incidents By Facility Type. Table B.6-6 summarizes the events causing contamination incidents at various facility types.

This analysis indicates that approximately 84 percent of the leachate events were associated with surface impoundments (30 percent), landfills (21 percent), tanks (9 percent) recycling/reclamation facilities (9 percent), percent). Facilities having the highest frequency of fires and explosions were surface impoundments (24 percent), landfills (18 percent) and containers (18 percent).

B.6.6 Chemicals Documented in Contamination Incidents. For this analysis, chemical compounds were organized into the following general categories:

Table B.6-5

USEPA REGION VI
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS

Event	Documented	Suspected	Total
Fire/Explosion	7	12	19
Spills	10	42	52
Leaks	6	57	63
Flood	8	13	21
Seismic Activity	0	2	2
Erosion	6	9	15
Leachate	15	45	60
Emission of Toxic Gases/Mists	3	14	17
Total	55	194	249

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.6-6

USEPA REGION VI
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS BY FACILITY TYPE

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Landfill	Fire/Explosion	2	5	0	7
	Spills	0	4	0	4
	Leaks	0	11	0	11
	Flood	3	2	0	5
	Seismic Activity	0	1	0	1
	Erosion	2	2	0	4
	Leachate	7	16	0	23
	Emission of Toxic Gases/Mists	0	4	0	4
	Other	0	0	0	0
Open Dump	Fire/Explosion	1	3	0	4
	Spills	0	7	0	7
	Leaks	0	8	0	8
	Flood	0	1	0	1
	Seismic Activity	0	1	0	1
	Erosion	0	3	0	3
	Leachate	1	5	0	6
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	0	0	0	0
Surface Impoundments	Fire/Explosion	1	8	0	9
	Spills	5	27	0	32
	Leaks	3	37	0	40
	Flood	5	8	0	13
	Seismic Activity	0	2	0	2
	Erosion	3	8	0	11
	Leachate	8	25	0	33
	Emission of Toxic Gases/Mists	1	5	0	6
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Incinerator	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	1	0	1
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	0	0	1	1
	Other	0	0	0	0
Injection Well	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	2	0	2
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	3	0	3
	Emission of Toxic Gases/Mists	1	0	0	1
	Other	0	0	0	0
Land Treatment	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	2	0	2
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Transportation Spill Site	Fire/Explosion	0	0	0	0
	Spills	1	1	0	2
	Leaks	1	1	0	2
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	1	0	2
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Storage Treatment Containers	Fire/Explosion	2	5	0	7
	Spills	3	19	0	22
	Leaks	2	22	0	24
	Flood	1	2	0	3
	Seismic Activity	0	0	0	0
	Erosion	0	3	0	3
	Leachate	1	8	0	9
	Emission of Toxic Gases/Mists	1	5	0	6
	Other	1	5	0	6
Storage Treatment Tanks	Fire/Explosion	1	3	0	4
	Spills	3	17	0	20
	Leaks	5	17	0	22
	Flood	1	1	0	2
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	9	0	10
	Emission of Toxic Gases/Mists	1	5	0	6
	Other	2	3	0	5
Storage Treatment Piles	Fire/Explosion	0	3	0	3
	Spills	1	5	0	6
	Leaks	1	6	0	7
	Flood	0	0	0	0
	Seismic Activity	0	1	0	1
	Erosion	0	2	0	2
	Leachate	1	7	0	8
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	0	7	0	7
Boilers Using Waste as Fuel(2)	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not evaluated in files evaluated.

Table B.6-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Recycling Reclamation	Fire/Explosion	0	2	0	2
	Spills	1	11	0	12
	Leaks	1	10	0	11
	Flood	0	4	0	4
	Seismic Activity	0	0	0	0
	Erosion	0	3	0	3
	Leachate	0	10	0	10
	Emission of Toxic Gases/Mists	0	3	0	3
	Other	0	5	0	5
Midnight Dump	Fire/Explosion	1	1	0	2
	Spills	1	2	0	3
	Leaks	0	2	0	2
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	1	0	1
	Leachate	1	3	0	4
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	0	1	0	1

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

- Volatile Halogenated Organics (VHOs)
- Volatile Non-halogenated Organics (VNHOs)
- Base Neutral Extractables (BNEs)
- Pesticides
- PCBs
- Metals
- Oil
- Ammonia/Ammonia Compounds
- Asbestos
- Inorganics
- Cyanide
- Acids
- Acid Compounds
- Alkalies
- Alcohols
- Aldehydes
- Ketones
- Radioactive

Table B.6-7 summarizes the total number of times that a chemical in a given category was positively identified by sampling and analytical techniques as occurring as contaminants in the various media.

Twelve of these chemical categories were identified at least once. This tabulation indicates that approximately 70 percent of the chemical categories were identified as either metals (29 percent), acid compounds (13 percent), base neutral extractables (11 percent), pesticides (9 percent) or VHOs (8 percent). Table B.6-8 lists the most commonly occurring chemicals found in each of these categories, and the range of concentrations observed in the affected media.

B.6.7 Damage Incidents. The following six affected areas were evaluated for site related damage on the DISF.

- Drinking Water
- Food Chain
- Flora
- Fauna
- Human Health
- Property Damage

In the remainder of this section damage will be interpreted to mean both documented and suspected incidents/events unless otherwise noted.

Damage was identified for at least 61 sites, or 63 percent of the sites evaluated. As noted in Section B.6.4, higher percentages of the sites indicated contamination (96 percent). Damage was indicated in approximately 66 percent of the contaminated sites evaluated. Of the 127 affected areas indicating damage, only 27 (21 percent) could be documented using the evaluation criteria.

Sites indicating the absence of damage, and/or files not containing sufficient information to determine damage, were also identified. A tabulation of sites identified with damage for at least one of the above categories is outlined in Table B.6-9. Of note, are the 40 sites (41 percent) identified as having damage to two or more affected areas. Of the 83 sites indicating soil contamination, 31 sites also indicated damage to drinking water. Also, of the 93 sites indicating soil and/or surface water contamination, 33 sites also indicated damage to flora, fauna or the food chain.

B.6.7.1 Tabulation of Number, Type and Severity of Damage Incidents. Table B.6-10 summarizes the total number of DISF responses indicating damage to the above affected areas. Site files not containing sufficient information to determine damage were also recorded and noted under the appropriate heading in Table B.6-10.

Table B.6-7

USEPA REGION VI
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF CHEMICALS DOCUMENTED IN CONTAMINATION INCIDENTS

Chemical Category	Total Positive Identifications	Percent of Total
Volatile Halogenated Organics (VHOs)	16	8
Volatile Non-halogenated Organics (VNHOs)	11	5
Base Neutral Extractables (BNEs)	22	11
Pesticides	19	9
PCBs	10	5
Metals	59	29
Oil	11	5
Ammonia/Ammonia Compounds	4	2
Inorganics	13	6
Cyanide	3	1
Acids	9	4
Acid Compounds	26	13
Alkalies	0	0
Alcohols	0	0
Aldehydes	0	0
Ketones	0	0
Radioactive	0	0
Asbestos	0	0
Others	0	0
Total	203	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-8

USEPA REGION VI
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

CONCENTRATION OF SELECTED CONTAMINANTS IDENTIFIED BY MEDIA

Most Frequently Observed Chemical Category	Contaminant	Contaminant Concentration Range			
		Groundwater (mg/l)	Surface Water (mg/l)	Soil (mg/kg)	Air (mg/l)
Metals	arsenic	0.01- 10.	0.01	4.5- 3,000	ND
	lead	0.028- 40.	0.04-12.	2.2-35,000	ND
	chromium	0.005- 10.	0.08- 2.5	3.9- 33.4	ND
Acid compounds	phenols	ND- 0.05	0.03- 0.8	0.05- 42.	ND
	pentachlorophenol	0.00003-0.03	0.1-124.	0.03-2,000	ND
	2,4 dinitrophenol	0.00005-0.015	ND	0.03-2,000	ND
BNEs	anthracene	ND	0.1	0.4- 124	ND
	bis (2 ethylhexyl) phthalate	0.01- .06	0.009	ND	ND
	naphthalene	0.03- .13	0.09	31	ND

Note: ND = no data available

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-9

USEPA REGION VI
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES DAMAGED

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented damage (to at least one affected area)	20	20
2	Sites indicating suspected damage (to at least one affected area) and not identified by Category 1 above	41	44
3	Sites indicating documented or suspected absence of damage and not identified by Categories 1 and 2 above	2	2
4	Sites for which there was an absence of sufficient information in the file to make a determination of damage and not identified by Categories 1,2 and 3 above	34	34
	TOTAL SITES	97	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-10

USEPA REGION VI
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY OF DAMAGE INCIDENTS

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	16	28	2	47	12	97
Food Chain	2	17	0	54	21	97
Flora	1	15	0	61	20	97
Fauna	5	12	0	59	20	97
Human Health	2	34	0	47	13	97
Property Damage	1	4	0	68	23	97

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	12	34	43	2	6	97
Human Health	1	9	26	14	47	97

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-10 indicates that 60 percent of the documented damage incidents occurred to drinking water, with the remaining incidents occurring to fauna (18 percent), food chain (7 percent), flora (4 percent), human health (7 percent) and property damage (4 percent).

Table B.6-10 indicates that of the 97 sites evaluated, 12 sites (12 percent) indicated high environmental damage, 34 sites (3 5percent) indicated medium environmental damage and 43 sites (44 percent) indicated low environmental damage. The remaining 8 site files indicated no apparent damage (6 percent) or did not have enough information available (2 percent) to make an evaluation. Of note, are the files associated with the 5 sites (5 percent) which suggested that the actual damage may be higher than the response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

The analysis also indicated that out of the 97 sites evaluated, one site indicated high human health damage, 9 sites (9 percent) indicated medium human health damage and 26 sites (27 percent) indicated low human health damage. The remaining 61 sites indicated no apparent damage (i.e there was no data available on public health damages) (49 percent) or, while there was some data, there was not enough information available to make an evaluation (15 percent). Of note, are the files associated with 14 sites (15 percent) which suggested that the actual human health damage may be higher than the severity response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

B.6.7.2 Tabulation of Number and Severity of Damage Incidents by Facility Type. Table B.6-11 summarizes the DISF responses indicating damage to each affected area by associated facility type. This analysis indicates that approximately 80 percent of the damage incidents were associated with surface impoundments (30 percent), landfills (14 percent), containers (12 percent), recycling/reclamation facilities (12 percent) or tanks (11 percent). The remaining 20 percent of the damage incidents were associated with open dumps, incinerators, injection wells, transportation spills, piles and midnight dumps.

Table B.6-11 also indicates that 77 percent of the incidents involving damage to drinking water involved surface impoundments (33 percent) and landfills, containers, tanks and recycling/ reclamation facilities (11 percent each). Table B.6-11 also identifies the severity of damage to environment and/or human health. Surface impoundments, landfills, containers, tanks and recycling/reclamation facilities resulted in 78 percent of the cases involving high or medium environmental damage and 84 percent of the cases involving high or medium human health damage.

B.6.8 Status of Response. Table B.6-12 summarizes the status of each site evaluated from the standpoint of enforcement, investigative and remedial activities. This table indicates that only 28 percent of the files evaluated indicated that the sites identified were involved in either past or present legal or enforcement actions. However, 44 (46 percent) site files indicated that additional environmental investigations were in progress or completed. Sixty-five (68 percent) sites were reported to be involved with past or present remedial activities.

Table B.6-11

USEPA REGION VI
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY DAMAGE INCIDENTS BY FACILITY TYPE

Landfill

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	3	5	1	13	4	26
Food Chain	0	7	0	14	5	26
Flora	0	6	0	14	6	26
Fauna	1	5	0	15	5	26
Human Health	0	9	0	13	4	26
Property Damage	0	1	0	19	6	26

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	6	8	9	2	1	26
Human Health	1	1	6	5	13	26

Open Dump

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	2	1	0	5	1	9
Food Chain	0	3	0	5	1	9
Flora	0	1	0	7	1	9
Fauna	0	2	0	6	1	9
Human Health	0	2	0	6	1	9
Property Damage	0	0	0	9	0	9

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	5	1	2	0	10
Human Health	0	1	1	3	5	10

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-11 (cont'd)(1)

Surface Impoundments

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	7	16	2	29	4	58
Food Chain	0	12	0	37	9	58
Flora	1	7	0	41	9	58
Fauna	2	8	0	38	10	58
Human Health	0	24	0	27	7	58
Property Damage	0	3	0	43	12	58

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	7	17	28	5	1	58
Human Health	0	4	19	9	26	58

Incinerator

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	1	0	1	0	2
Food Chain	0	0	0	1	0	2
Flora	0	0	0	1	0	2
Fauna	0	0	0	1	0	2
Human Health	0	1	0	1	0	2
Property Damage	0	0	0	1	0	2

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	1	0	0	0	2
Human Health	0	0	1	0	1	2

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-11 (cont'd)(1)

Injection Well

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	2	0	2	1	5
Food Chain	0	1	0	2	2	5
Flora	0	0	0	3	2	5
Fauna	0	0	0	3	2	5
Human Health	0	0	0	3	2	5
Property Damage	0	1	0	2	2	5

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	1	2	2	0	5
Human Health	0	0	0	2	3	5

Land Treatment

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	1	0	1
Food Chain	0	0	0	1	0	1
Flora	0	0	0	1	0	1
Fauna	0	0	0	1	0	1
Human Health	0	0	0	1	0	1
Property Damage	0	0	0	1	0	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	1	0	0	1
Human Health	0	0	0	0	1	1

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-11 (cont'd)(1)

Transportation Spill Site

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	2	0	0	0	0	2
Food Chain	0	0	0	2	0	2
Flora	0	1	0	1	0	2
Fauna	0	0	0	2	0	2
Human Health	0	2	0	0	0	2
Property Damage	0	0	0	2	0	2

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	1	0	0	0	2
Human Health	0	0	2	0	0	2

Storage Treatment Containers

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	3	5	0	22	5	35
Food Chain	1	6	0	22	6	35
Flora	1	3	0	25	6	35
Fauna	1	3	0	26	5	35
Human Health	0	9	0	21	5	35
Property Damage	0	1	0	28	6	35

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	5	8	12	7	3	35
Human Health	0	2	7	7	19	35

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-11 (cont'd)(1)

Storage Treatment Tanks

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	1	7	0	19	5	32
Food Chain	1	3	0	22	6	32
Flora	0	2	0	26	4	32
Fauna	1	4	0	21	6	32
Human Health	1	9	0	17	5	32
Property Damage	0	1	0	25	6	32

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	3	9	14	5	1	32
Human Health	0	4	5	6	17	32

Storage Treatment Piles

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	4	0	9	4	17
Food Chain	0	4	0	7	6	17
Flora	0	3	0	10	4	17
Fauna	0	5	0	6	6	17
Human Health	0	6	0	6	5	17
Property Damage	0	1	0	11	5	17

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	6	7	4	0	17
Human Health	0	1	6	5	5	17

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-11 (cont'd)(1)

Boilers Using Waste as Fuel(2)

	Damage		No Damage		Insufficient Information Available in File	
Affected Area	Documented	Suspected	Documented	Suspected		Total
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

Recycling/Reclamation

	Damage		No Damage		Insufficient Information Available in File	
Affected Area	Documented	Suspected	Documented	Suspected		Total
Drinking Water	1	7	0	8	0	16
Food Chain	1	5	0	8	2	16
Flora	0	2	0	13	1	16
Fauna	2	4	0	8	2	16
Human Health	0	11	0	5	0	16
Property Damage	0	0	0	14	2	16

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	5	6	4	1	0	16
Human Health	0	4	6	1	5	16

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.6-11 (cont'd)(1)

Midnight Dump

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	1	2	0	2	0	5
Food Chain	0	1	0	2	2	5
Flora	0	1	0	2	2	5
Fauna	0	1	0	2	2	5
Human Health	0	3	0	2	0	5
Property Damage	0	1	0	2	2	5

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	3	2	0	0	5
Human Health	0	1	2	1	1	5

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.6-12

USEPA REGION VI
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

STATUS OF RESPONSE

Total Number of Sites...

...evaluated	...with legal/ enforcement action underway/completed	...with investigative actions underway/completed	...with remedial actions underway/completed
97	27	44	65

DESCRIPTION OF REMEDIAL ACTIVITY

Damage Incident	Facility type	Location	Remedial Activity	Costs ($)
1. Spill, Leak, Leachate	STC, R/R	Ft. Smith AK	Install monitoring wells, land surveys, contain pollutants; ultimate removal to bulk disposal facility	1,000,000
2. Leachate, Runoff	LF,SI, STT	Mena, AK	Health study, containment and treatment of discharge. Alternate public water supply. Cleanup of soil. Containment of groundwater contamination	50,000 - 7,900,000

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(290)

Table B.6-12 also compares the damage incident type with the remedial activities and related costs for sites having cost data available. These activities included removal of wastes and groundwater withdrawal and treatment. Expenditures for remedial activities for the sites ranged from $50,000 to $7,900,000.

Section B.7

B.7 Region VII Summary

B.7.1 Region VII Overview. The study team evaluated and completed DISFs for 24 sites in Region VII. Many of these sites contained multiple facilities. A total of 43 facility types were used in describing the sites in this region. Of the 43 facility types evaluated, 37 percent were landfills, 14 percent were containers, 12 percent were surface impoundments and 9 percent were tanks. The remaining 28 percent of the facility types were described by various other categories. As discussed in Sections 3.1 and 3.2 the reader should note for the following discussion that the data bases and the selection criteria utilized on this study limit the applicability of the conclusion reached herein to other populations of hazardous waste sites.

Contamination, either documented or suspected, was identified in at least 21 of the sites evaluated. At 18 of the sites, or 75 percent, contamination was documented. Thirty-five percent of the contamination incidents occurred to surface water, with the remaining incidents occurring to groundwater (29 percent), soil (27 percent) and air (9 percent). Of the 52 responses originally indicating contamination, only 34 (65 percent) could be documented using the evaluation criteria developed in Section 3.1.4. Each site was evaluated for damage occurring to life, property and various natural resources. The evaluation focused on six potentially affected areas, including drinking water, food chain, flora, fauna, human health and property. Damage, (either documented or suspected), was identified in at least 15 sites, or 63 percent of the sites evaluated. Of the 34 affected areas originally indicating damage, only 10 (29 percent) could be documented using the evaluation criteria. Approximately 40 percent of the documented damage incidents occurred to property, with the remaining incidents occurring to drinking water (30 percent), human health (20 percent) and flora (10 percent). Both of the incidents involving documented damage to human health involved workers.

Seventy-seven percent of the incidents causing the damage or contamination described above were identified as leachate (35 percent), leaks (17 percent) erosion (15 percent) or spills (10 percent). These incidents involved contamination caused by volatile halogenated organics, acid compounds, or metals in 51 percent of the incidents tabulated.

B.7.2 Sources. The study team preliminarily identified 42 files in Region VII for review. File sources included 33 FIT Files, 8 S&A Files and 1 Enforcement file. Seven files were not reviewed because either the FIT team or EPA subcontractor had negotiated a confidentiality agreement with the site owners. Based upon a review of the remaining 35 sites, 11 were eliminated from the study because they did not conform to the Selection Criteria summarized in Section 3.1, Table 3-1.

B.7.3 Tabulation of Site Descriptions by Facility Type. Each site was evaluated and categorized by one or more of the following fourteen site descriptions as listed in Section IIA of the DISFs.

- Landfill Facility
- Open Dump
- Surface Impoundment
- Incinerator
- Injection Well
- Land Treatment
- Transportation Spill Site
- Storage/Treatment Containers
- Storage/Treatment Tanks
- Storage/Treatment Piles
- Boilers Using Waste as Fuel
- Recycling/Reclamation
- Midnight Dump
- Other

For the 24 sites evaluated in the region, 9 of these categories were identified at least once, along with an additional "other" category not listed in the DISF. This other category was a chemical repackaging facility. Table B.7-1 summarizes the total number of categories used in describing the 24 sites evaluated. Many of these sites contained multiple facilities. A total of 43 facility types were used in describing the sites in this region. Of the 43 facility types evaluated approximately 72 percent were identified as either landfills (37 percent), containers (14 percent) surface impoundments (12 percent) or tanks (9 percent). A total of 11 sites were described by 2 or more facility types and 6 sites by three or more.

B.7.4 Contamination Incidents. Four media, i.e. groundwater, surface water, air and soil, were evaluated for site-related contamination in Section V of the DISF. In the remainder of this section, contamination will be interpreted to mean both documented and suspected incidents/events, unless otherwise noted. Sites indicating the absence of contamination, and/or files not containing sufficient information to determine the presence of contamination, were also identified. Table B.7-2 summarizes the number of sites identified with contamination in at least one of the above media.

Contamination incidents were identified at 21 of the sites evaluated. A total of 52 incidents involving various media were recorded at these sites of which 34 (65 percent) could be documented by sampling and analytical data. Seventeen sites were identified with contamination in two or more media. For example, of the 14 sites indicating soil contamination, 10 sites also indicated groundwater contamination. File data indicated that 20 sites were contaminated from incident(s) occurring at the site evaluated. File data for the remaining site indicated that contamination may have originated off-site.

B.7.4.1 Tabulation of Media Exposed to Contamination. Table B.7-3 summarizes the total number of DISF responses indicating contamination or the absence of contamination found by media. There were six site files not containing sufficient information to determine contamination recorded for each of the media evaluated and noted under the appropriate heading in Table B.7-3. This table indicates that 35 percent of the contamination incidents occurred to surface water. The remaining incidents occurred to either groundwater (29 percent), soil (27 percent) or air (9 percent). In many cases, contamination to more than one media occurred at any particular site.

B.7.4.2 Tabulation of Media Exposed to Contamination Incidents by Facility Type. Table B.7-4 summarizes the total number of DISF responses indicating media contamination associated with each facility type. This analysis suggests that approximately 69 percent of the sites associated with contamination incidents were identified as either landfills (46 percent), surface impoundments (12 percent), or midnight dumps (11 percent). Table B.7-4 indicates that, for most of the incidents tabulated, in decreasing order of occurence, contamination to:

- groundwater was associated with landfills, surface impoundment, land treatments and midnight dumps;
- surface water was associated with landfills, containers, surface impoundments, land treatments and midnight dumps;
- soil was associated with landfills, containers, open and midnight dumps; and

Table B.7-1

USEPA REGION VII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITE DESCRIPTIONS BY TYPE

Facility Type	Total Number of Responses Described as Given Facility Type	Percent of Total
Landfill	16	37
Open Dump	2	5
Surface Impoundment	5	12
Incinerator(2)	0	0
Injection Well(2)	0	0
Land Treatment	3	7
Transportation Spill Site	1	2
Storage/Treatment Containers	6	14
Storage/Treatment Tanks	4	9
Storage/Treatment Piles(2)	0	0
Boilers Using Waste(2)	0	0
Recylcing/Reclamation	2	5
Midnight Dump	3	7
Other	1	2
Total	43	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.7-2

USEPA REGION VII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[1]

TABULATION OF SITES EXPOSED TO CONTAMINATION INCIDENTS

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented contamination (to at least one medium)	18	75
2	Sites indicating suspected contamination (to at least one medium) and not identified by Category 1 above	3	13
3	Sites indicating documented or suspected absence of contamination and not identified by Categories 1 and 2 above	2	8
4	Sites for which there was an absence of sufficient information in the file to make a determination of contamination, and not identified by Categories 1, 2 or 3 above	1	4
	TOTAL SITES	24	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.7-3

USEPA REGION VII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT

Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
	Documented	Suspected	Documented	Suspected		
Groundwater	10	5	1	2	6	24
Surface Water	12	6	1	3	2	24
Air	4	1	0	13	6	24
Soil	8	6	0	4	6	24

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.7-4

USEPA REGION VII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO DAMAGE INCIDENT BY FACILITY TYPE

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Landfill	Groundwater	7	4	1	1	3	16
	Surface Water	5	6	1	2	2	16
	Air	1	-	-	12	3	16
	Soil	5	2	-	3	6	16
Open Dump	Groundwater	-	1	-	-	1	2
	Surface Water	-	1	-	-	1	2
	Air	-	-	-	1	1	2
	Soil	1	1	-	-	-	2
Surface Impoundment	Groundwater	1	2	1	-	1	5
	Surface Water	2	-	1	-	2	5
	Air	-	2	-	1	2	5
	Soil	-	1	-	-	4	5
Incinerator(2)	Groundwater						
	Surface Water						
	Air						
	Soil						

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.7-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Injection Well(2)	Groundwater						
	Surface Water						
	Air						
	Soil						
Land Treatment	Groundwater	1	1	1	-	-	3
	Surface Water	-	2	1	-	-	3
	Air	-	1	-	1	1	3
	Soil	-	2	-	-	1	3
Transportation Spill Site	Groundwater	-	-	-	-	1	3
	Surface Water	-	-	-	-	1	3
	Air	-	-	-	-	1	3
	Soil	-	1	-	-	-	3
Storage Treatment Containers	Groundwater	1	-	-	3	2	6
	Surface Water	1	1	-	3	1	6
	Air	-	1	-	3	2	6
	Soil	2	-	-	3	1	6
Storage Treatment Tanks	Groundwater	0	0	0	2	2	4
	Surface Water	0	0	0	2	2	4
	Air	0	0	0	2	2	4
	Soil	0	0	0	2	2	4
Storage Treatment Piles(2)	Groundwater						
	Surface Water						
	Air						
	Soil						

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.7-4 (cont'd)[(1)]

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Boilers Using Waste as Fuel(2)	Groundwater						
	Surface Water						
	Air						
	Soil						
Recycling Reclamation	Groundwater	-	-	-	1	1	2
	Surface Water	-	1	-	1	-	2
	Air	-	-	-	1	1	2
	Soil	-	1	-	1	-	2
Midnight Dump	Groundwater	2	-	-	-	1	3
	Surface Water	1	1	-	-	1	3
	Air	1	-	-	1	1	3
	Soil	2	-	-	-	1	3

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

- air was associated with surface impoundments, landfills, land treatments and containers.

B.7.5 Events Causing Contamination. Contaminated sites were associated with one or more of the following events, as outlined in Section VIII of the DISF.

- Fire/Explosion
- Spill
- Leak
- Flood
- Seismic Activity
- Erosion
- Leachate
- Emission of Toxic Gases/Mists

In the remainder of this section, events tabulated will include both documented and suspected events, unless otherwise noted.

Seven of these events were identified at least once, along with one other type not listed in the DISF. This other event was described as a wastewater discharge. A total of 15 sites (62 percent) were involved in two events and 8 sites (33 percent) in three or more events.

B.7.5.1 Tabulation of Events Causing Contamination Incidents. Table B.7-5 summarizes the total number of events causing contamination incidents. In total, 48 contamination events involving various facility types were recorded in the DISFs. For this region, this tabulation indicates that approximately 77 percent of the contamination events were related to leachate (35 percent), leaks (17 percent) erosion (15 percent) or spills (10 percent). Of the 48 contamination events tabulated, 23 (48 percent) could be documented from information available in the file.

B.7.5.2 Tabulation of Events Causing Contamination Incidents By Facility Type. Table B.7-6 summarizes the events causing contamination incidents at various facility types. Since a number of sites contained a multiple number of facilities, there were a number of cases where there was insufficient information available in the file to identify the damage incident with the specific facility unit in question. These represented approximately 8 percent of the total and are identified in Table B.7-6.

This analysis indicates that approximately 72 percent of the leachate events were associated with landfills (53 percent) or surface impoundments (19 percent). Air pollution events, i.e., emissions of toxic gases and mists, were most commonly associated with landfills and surface impoundments. Facilities having the highest frequency of fires and explosions were containers and recyclers.

B.7.6 Chemicals Documented in Contamination Incidents. For this analysis, chemical compounds were organized into the following general categories:

- Volatile Halogenated Organics (VHOs)
- Volatile Non-halogenated Organics (VNHOs)
- Base Neutral Extractables (BNEs)
- Pesticides
- PCBs
- Metals
- Oil
- Ammonia/Ammonia Compounds
- Asbestos
- Inorganics
- Cyanide
- Acids
- Acid Compounds
- Alkalies
- Alcohols
- Aldehydes
- Ketones
- Radioactive

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Table B.7-5

USEPA REGION VII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS

Event	Documented	Suspected	Total
Fire/Explosion	3	0	3
Spills	2	3	5
Leaks	3	5	8
Flood	1	0	1
Seismic Activity	0	0	0
Erosion	3	4	7
Leachate	5	12	17
Emission of Toxic Gases/Mists	2	1	3
Other	4	0	4
Total	23	25	48

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.7-6

USEPA REGION VII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS BY FACILITY TYPE

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Landfill	Fire/Explosion	-	1	-	1
	Spills	1	-	-	1
	Leaks	1	1	-	2
	Flood	-	-	-	-
	Seismic Activity	-	-	-	-
	Erosion	3	-	-	3
	Leachate	4	10	1	15
	Emission of Toxic Gases/Mists	1	-	-	1
	Other	2	-	-	2
Open Dump	Fire/Explosion	-	1	-	1
	Spills	-	-	-	-
	Leaks	-	1	-	1
	Flood	-	-	-	-
	Seismic Activity	-	-	-	-
	Erosion	-	1	-	1
	Leachate	-	2	-	2
	Emission of Toxic Gases/Mists	-	-	-	-
	Other	-	-	-	-
Surface Impoundments	Fire/Explosion	-	-	-	-
	Spills	-	-	-	-
	Leaks	-	2	-	2
	Flood	-	-	-	-
	Seismic Activity	-	-	-	-
	Erosion	-	-	-	-
	Leachate	-	5	-	5
	Emission of Toxic Gases/Mists	1	1	-	2
	Other	1	-	-	1

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.7-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Incinerator(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				
Injection Well(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				
Land Treatment	Fire/Explosion	-	-	-	-
	Spills	-	-	-	-
	Leaks	-	-	-	-
	Flood	-	-	-	-
	Seismic Activity	-	-	-	-
	Erosion	-	-	-	-
	Leachate	-	3	-	3
	Emission of Toxic Gases/Mists	-	1	-	1
	Other	-	-	-	-
Transportation Spill Site	Fire/Explosion	-	-	-	-
	Spills	1	-	-	1
	Leaks	-	-	-	-
	Flood	-	1	-	1
	Seismic Activity	-	-	-	-
	Erosion	-	-	-	-
	Leachate	-	-	-	-
	Emission of Toxic Gases/Mists	-	-	-	-
	Other	-	-	-	-

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.7-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Storage Treatment Containers	Fire/Explosion	2	-	-	2
	Spills	-	1	-	1
	Leaks	1	2	-	3
	Flood	-	-	-	-
	Seismic Activity	-	-	-	-
	Erosion	-	-	-	-
	Leachate	-	-	-	-
	Emission of Toxic Gases/Mists	-	-	-	-
	Other	-	-	-	-
Storage Treatment Tanks	Fire/Explosion	-	-	-	-
	Spills	-	1	-	1
	Leaks	-	2	1	3
	Flood	-	-	-	-
	Seismic Activity	-	-	-	-
	Erosion	-	-	-	-
	Leachate	-	-	-	5
	Emission of Toxic Gases/Mists	-	-	-	-
	Other	-	-	-	-
Storage Treatment Piles(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				
Boilers Using Waste as Fuel(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.7-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Recycling Reclamation	Fire/Explosion	1	-	-	1
	Spills	-	1	-	1
	Leaks	-	1	-	1
	Flood	-	-	-	-
	Seismic Activity	-	-	-	-
	Erosion	-	-	-	-
	Leachate	-	-	-	-
	Emission of Toxic Gases/Mists	-	-	-	-
	Other	-	-	-	-
Midnight Dump	Fire/Explosion	-	-	-	-
	Spills	1	-	-	-
	Leaks	1	1	-	2
	Flood	-	-	-	-
	Seismic Activity	-	-	-	-
	Erosion	1	-	-	1
	Leachate	1	1	-	2
	Emission of Toxic Gases/Mists	-	-	-	-
	Other	2	-	-	2

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.7-7 summarizes the total number of times that a chemical in a given category was positively identified by sampling and analytical techniques as occurring as contaminants in the various media.

Eleven of these chemical categories were identified at least once. This tabulation indicates that approximately 51 percent of the chemical categories were identified as either metals (19 percent), VHOs (17 percent) or acid compounds (15 percent). Table B.7-8 lists the most commonly occurring chemicals found in each of these categories.

B.7.7 Damage Incidents. The following six affected areas were evaluated for site related damage on the DISF.

- Drinking Water
- Food Chain
- Flora
- Fauna
- Human Health
- Property Damage

In the remainder of this section damage will be interpreted to mean both documented and suspected incidents/events unless otherwise noted.

Damage was identified for at least 15 sites, or 63 percent, of the sites evaluated. As noted in Section B.7.4, 21 of the sites indicated contamination (88 percent). Damage was indicated in approximately 71 percent of the contaminated sites evaluated. Of the 34 affected areas indicating damage, only 10 (29 percent) could be documented using the evaluation criteria.

Sites indicating the absence of damage, and/or files not containing sufficient information to determine damage, were also identified. A tabulation of sites identified with damage for at least one of the above categories is outlined in Table B.7-9. Of note, are the 12 sites (50 percent) identified as having damage to two or more affected areas. Of the 14 sites indicating soil contamination, 7 sites also indicated damage to drinking water. Also, of the 18 sites indicating soil and/or surface water contamination, 7 sites also indicated damage to flora, fauna or the food chain.

B.7.7.1 Tabulation of Number, Type and Severity of Damage Incidents. Table B.7-10 summarizes the total number of DISF responses indicating damage to the above affected areas. Site files not containing sufficient information to determine damage were also recorded and noted under the appropriate heading in Table B.7-10.

Table B.7-10 indicates that 40 percent of the documented damage incidents occurred to property, with the remaining incidents occurring to drinking water (30 percent), human health (20 percent) and flora (10 percent).

Table B.7-10 indicates that of the 24 sites evaluated, 8 sites (33 percent) indicated high environmental damage, 5 sites (21 percent) indicated medium environmental damage and 2 sites (8 percent) indicated low environmental damage. The remaining 9 site files indicated no apparent damage (i.e. there was no data available on public health damages) (5 percent) or, while there was some data, there was not enough information available (33 percent) to make an evaluation. Of note, are the files associated with the 8 sites (33 percent) which suggested that the actual damage may be higher than the response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

Table B.7-7

USEPA REGION VII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF CHEMICALS DOCUMENTED IN CONTAMINATION INCIDENTS

Chemical Category	Total Positive Identifications	Percent of Total
Volatile Halogenated Organics (VHOs)	8	17
Volatile Non-halogenated Organics (VNHOs)	3	6
Base Neutral Extractables (BNEs)	5	11
Pesticides	5	11
PCBs	2	4
Metals	9	19
Oil	2	4
Ammonia/Ammonia Compounds	0	0
Inorganics	2	4
Cyanide	3	6
Acids	0	0
Acid Compounds	7	15
Alkalies	0	0
Alcohols	0	0
Aldehydes	1	3
Ketones	0	0
Radioactive	0	0
Asbestos	0	0
Others	0	0

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.7-8

USEPA REGION VII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES

CONCENTRATION OF SELECTED CONTAMINANTS IDENTIFIED BY MEDIA

Most Frequently Observed Chemical Category	Contaminant	Contaminant Concentration Range			
		Groundwater (mg/l)	Surface Water (mg/l)	Soil (mg/kg)	Air (mg/l)
VHOs	1,1,1 trichloroethane	X	X	ND	ND
	trichloroethylene	X	X	ND	ND
Acid Compound	phenols (NOS)	X	X	X	X
	trichlorophenol	X	X	X	
	bis-phenol	ND	ND	X	ND
Metals	manganese	X	X	X	ND
	arsenic	X	X	X	ND
	chromium	X	X	ND	ND

NOTES:

X = information is confidential and therefore not available
ND = no data available

Table B.7-9

USEPA REGION VII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES DAMAGED

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented damage (to at least one affected area)	6	25
2	Sites indicating suspected damage (to at least one affected area) and not identified by Category 1 above	9	37.5
3	Sites indicating documented (or suspected) absence of damage and not identified by Categories 1 and 2 above	3	12.5
4	Sites for which there was an absence of sufficient information in the file to make a determination of damage and not identified by Categories 1, 2 and 3 above	6	25
	TOTAL SITES	24	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.7-10

USEPA REGION VII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY OF DAMAGE INCIDENTS

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	3	8	1	4	8	24
Food Chain	-	1	-	-	23	24
Flora	1	6	-	8	9	24
Fauna	-	7	-	8	9	24
Human Health	2	1	-	8	13	24
Property Damage	4	1	-	8	11	24

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Pesponses
Environmental	8	5	2	8	1	24
Human Health	1	-	-	17	6	24

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

The analysis also indicated that out of the 24 sites evaluated, one site indicated high human health damage, and no sites indicated medium or low human health damage. The remaining 23 sites indicated no apparent damage (25 percent) or did not have enough information available to make an evaluation (71 percent). Of note, are the files associated with 17 sites (71 percent) which suggested that the actual human health damage may be higher than the severity response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

B.7.7.2 Tabulation of Number and Severity of Damage Incidents by Facility Type. Table B.7-11 summarizes the DISF responses indicating damage to each affected area by associated facility type. This analysis indicates that approximately 84 percent of the damage incidents were associated with landfills (66 percent) or containers (18 percent). The remaining 16 percent of the damage incidents were associated with land treatments and surface impoundments.

Table B.7-11 also indicates that 79 percent of the incidents involving damage to drinking water involved landfills (53 percent) , land treatment (13 percent), and surface impoundments (13 percent).

Table B.7-11 also identifies the severity of damage to environment and/or human health. Landfills, storage facilities and surface impoundments resulted in 66 percent of the cases involving high or medium environmental damage and the case involving high human health damage.

B.7.8 Status of Response. Table B.7-12 summarizes the status of each site evaluated from the standpoint of enforcement, investigative and remedial activites. This table indicates that only 29 percent of the files evaluated indicated that the sites identified were involved in either past or present legal or enforcement actions. However, 17 (71 percent) site files indicated that additional environmental investigations were in progress or completed. Five (20 percent) sites were reported to be involved with past or present remedial activities.

Table B.7-12 also compares the damage incident type with the remedial activities and related costs for sites having cost data available. These activities included drum excavation, containment recovery systems and cut-off trenches. Expenditures for remedial activities for the sites ranged from $50,000 to $10,000,000.

Table B.7-11

USEPA REGION VII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY DAMAGE INCIDENTS BY FACILITY TYPE

Landfill

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	1	7	1	2	5	16
Food Chain	0	0	0	7	9	16
Flora	0	3	0	5	8	16
Fauna	0	2	0	5	9	16
Human Health	1	0	0	6	9	16
Property Damage	3	0	0	5	8	16

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	4	2	2	5	3	16
Human Health	1	1	0	9	5	16

Open Dump

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	0	2	2
Food Chain	0	0	0	0	2	2
Flora	0	1	0	0	1	2
Fauna	0	1	0	0	1	2
Human Health	0	0	0	0	2	2
Property Damage	0	0	0	0	2	2

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	0	1	0	2
Human Health	0	0	0	2	0	2

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.7-11 (cont'd)(1)

Surface Impoundments

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	2	1	0	2	5
Food Chain	0	1	0	2	2	5
Flora	0	0	0	2	3	5
Fauna	0	1	0	2	2	5
Human Health	0	1	0	2	2	5
Property Damage	0	0	0	2	3	5

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	0	0	3	0	5
Human Health	0	0	0	3	2	5

Incinerator(2)

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	0	0	0
Food Chain	0	0	0	0	0	0
Flora	0	0	0	0	0	0
Fauna	0	0	0	0	0	0
Human Health	0	0	0	0	0	0
Property Damage	0	0	0	0	0	0

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	0	0	0
Human Health	0	0	0	0	0	0

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

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Table B.7-11 (cont'd)(1)

Injection Well(2)

Affected Area	Damage: Documented	Damage: Suspected	No Damage: Documented	No Damage: Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	0	0	0
Food Chain	0	0	0	0	0	0
Flora	0	0	0	0	0	0
Fauna	0	0	0	0	0	0
Human Health	0	0	0	0	0	0
Property Damage	0	0	0	0	0	0

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	0	0	0
Human Health	0	0	0	0	0	0

Land Treatment

Affected Area	Damage: Documented	Damage: Suspected	No Damage: Documented	No Damage: Suspected	Insufficient Information Available in File	Total
Drinking Water	1	1	1	0	0	3
Food Chain	0	0	0	3	0	3
Flora	0	0	0	2	1	3
Fauna	0	0	0	2	1	3
Human Health	0	0	0	1	2	3
Property Damage	1	0	0	1	1	3

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	0	1	1	3
Human Health	0	0	0	3	0	3

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.7-11 (cont'd)(1)

Transportation Spill Site

	Damage		No Damage		Insufficient Information Available in File	
Affected Area	Documented	Suspected	Documented	Suspected		Total
Drinking Water	0	0	0	0	1	1
Food Chain	0	0	0	0	1	1
Flora	0	0	0	0	1	1
Fauna	0	0	0	0	1	1
Human Health	0	0	0	0	1	1
Property Damage	0	0	0	0	1	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	1	0	1
Human Health	0	0	0	1	0	1

Storage Treatment Containers

	Damage		No Damage		Insufficient Information Available in File	
Affected Area	Documented	Suspected	Documented	Suspected		Total
Drinking Water	0	1	0	3	2	6
Food Chain	0	0	0	3	3	6
Flora	0	2	0	3	1	6
Fauna	0	2	0	3	1	6
Human Health	0	0	0	5	1	6
Property Damage	1	1	0	3	1	6

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	1	0	1	3	6
Human Health	0	0	0	2	4	6

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.7-11 (cont'd)(1)

Storage Treatment Tanks

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	2	2	4
Food Chain	0	0	0	2	2	4
Flora	0	0	0	1	3	4
Fauna	0	0	0	1	3	4
Human Health	0	0	0	2	2	4
Property Damage	0	0	0	2	2	4

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	3	1	4
Human Health	0	0	0	2	2	4

Storage Treatment Piles(2)

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	0	0	
Food Chain	0	0	0	0	0	
Flora	0	0	0	0	0	
Fauna	0	0	0	0	0	
Human Health	0	0	0	0	0	
Property Damage	0	0	0	0	0	

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	0	0	0
Human Health	0	0	0	0	0	0

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.7-11 (cont'd)(1)

Boilers Using Waste as Fuel(2)

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	0	0	
Food Chain	0	0	0	0	0	
Flora	0	0	0	0	0	
Fauna	0	0	0	0	0	
Human Health	0	0	0	0	0	
Property Damage	0	0	0	0	0	

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	0	0	0
Human Health	0	0	0	0	0	0

Recycling/Reclamation

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	2	0	2
Food Chain	0	0	0	2	0	2
Flora	0	0	0	1	1	2
Fauna	0	0	0	1	1	2
Human Health	0	0	0	2	0	2
Property Damage	0	0	0	2	0	2

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	1	0	0	1	2
Human Health	0	0	0	0	2	2

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.7-11 (cont'd)(1)

Midnight Dump

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	2	0	1	0	3
Food Chain	0	0	0	2	1	3
Flora	0	1	0	1	1	3
Fauna	0	2	0	1	0	3
Human Health	0	0	0	2	1	3
Property Damage	2	0	0	1	0	3

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	2	0	1	0	3
Human Health	0	0	0	1	2	3

Chemical Repackaging Facility

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	1	1	0	2	0	4
Food Chain	0	0	0	1	3	4
Flora	0	0	0	1	3	4
Fauna	0	0	0	1	3	4
Human Health	0	2	0	2	0	4
Property	1	1	0	1	1	4

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	1	1	1	1	4
Human Health	0	1	0	1	2	4

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.7-12

USEPA REGION VII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

STATUS OF RESPONSE

Total Number of Sites...

24 evaluated	7 with legal/ enforcement action underway/completed	17 with investigative actions underway/completed	5 with remedial actions underway/completed

DESCRIPTION OF REMEDIAL ACTIVITY

Damage Incident	Facility type	Location	Remedial Activity	Costs ($)
1. Fire, Leaks	Landfill Storage	IO	Drum removal, soil excavation	50,00-500,000
2. Spills, Leaks, Leachate	Landfill Surface Impoundment Treatment	MO	Installation of concontaminant recovery pump, spill clean-up (other site clean-up activities not specified)	10,000,000
3. Leachate	Midnight Dump	MO	Drum and contaminated soil excavation, proposed waste treatment (ultraviolet phytolysis)	2,500,000
4. Spills, Leaks, Leachate, Erosion	Midnight Dump	MO	Drum excavation storage and final disposal	Not available
5. Leachate, Erosion	Landfill		Construction of earthen drums, leachate cut-off trenches	Not available

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Section B.8

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B.8 Region VIII Summary

B.8.1 Region VIII Overview. The study team evaluated and completed DISFs for 40 sites in Region VIII. Many of these sites contained multiple facilities. A total of 50 facility types were used in describing the sites in this region. Of the 50 facility types evaluated, 24 percent were landfills, 24 percent were surface impoundments, 12 percent were radiation sites, 8 percent were containers, and 8 percent were piles. The remaining 24 percent of the facility types were described by various other categories. As discussed in Sections 3.1 and 3.2 the reader should note for the following discussion that the data bases and the selection criteria utilized on this study limit the applicability of the conclusions reached herein to other populations of hazardous waste sites.

Contamination, either documented or suspected, was identified in 34 sites, or 85 percent of sites evaluated. At 27 of the sites, or 68 percent, contamination was documented. Thirty-one percent of the contamination incidents occurred to surface water, with the remaining incidents occurring to soil (29 percent), groundwater (28 percent) and air (12 percent). Of the 85 responses originally indicating contamination, only 40 (47 percent) could be documented using the evaluation criteria developed in Section 3.1.4. Each site was evaluated for damage occurring to life, property, and various natural resources. This evaluation focused on six potential affected areas, including drinking water, food chain, flora, fauna, human health and property. Damage, (either documented or suspected), was identified in at least 24 sites, or 60 percent of the sites evaluated. Of the 46 affected areas originally indicating damage, only 19 (41 percent) could be documented using the evaluation criteria. Approximately 58 percent of the documented damage incidents occurred to property, with the remaining incidents occurring to human health (16 percent), drinking water (11 percent), fauna (11 percent) and food chain (5 percent). Non-workers were involved in all of the three incidents involving documented damage to human health. Sixty-six percent of the incidents causing the damage or contamination described above were due to leachate (32 percent), others (18 percent) or leaks (16 percent). These incidents involved contamination caused by volatile halogenated organics, volatile nonhalogenated organics or metals in 82 percent of the incidents tabulated.

B.8.2 Sources. The study team preliminarily identified 94 files in Region VIII for review. File sources included 32 FIT Files, 52 uncontrolled site files, and 10 S&A Files. Based upon a review of the 94 sites, 54 were eliminated from the study because they did not conform to the Selection Criteria summarized in Section 3.1, Table 3-1.

B.8.3 Tabulation of Site Descriptions by Facility Type. Each site was evaluated and categorized by one or more of the following thirteen site descriptions as listed in Section IIA of the DISFs.

- Landfill Facility
- Open Dump
- Surface Impoundment
- Incinerator
- Injection Well
- Land Treatment
- Transportation Spill Site
- Storage/Treatment Containers
- Storage/Treatment Tanks
- Storage/Treatment Piles
- Boilers Using Waste as Fuel
- Recycling/Reclamation
- Midnight Dump
- Other

For the 40 sites evaluated in the region, 11 of these categories were identified at least once, along with an additional 4 "other" categories not listed in the DISF. These other categories included radiation sites, lumber treatment (abandoned facility), septic system overflow and re-use of empty pesticide drums by a private individual. Table B.8-1 summarizes the total number of categories used in describing the 40 sites evaluated. Many of these sites contained multiple facilities. A total of 50 facility types were used in describing the sites in this region. Of the 50 facility types evaluated, approximately 76 percent of the sites were identified as either surface impoundments (24 percent), landfills (24 percent), radiation sites (12 percent), containers (8 percent) or piles (8 percent). A total of 7 facility types were described by 2 or more facility types categories and 2 sites by three or more facility types.

B.8.4 Contamination Incidents. Four media, i.e. groundwater, surface water, air and soil, were evaluated for site-related contamination in Section V of the DISF. In the remainder of this section, contamination will be interpreted to mean both documented and suspected incidents/events, unless otherwise noted. Sites indicating the absence of contamination, and/or files not containing sufficient information to determine the presence of contamination, were also identified. Table B.8-2 summarizes the number of sites identified with contamination in at least one of the above media.

Contamination incidents were identified in at least 34 sites, or 85 percent of the sites evaluated. A total of 85 incidents involving various media were recorded at these sites of which 40 (47 percent) could be documented by sampling and analytical data. Twenty-nine sites were identified with contamination in two or more media. For example, of the 25 sites indicating soil contamination, 17 sites also indicated groundwater contamination. File data indicated that 33 sites were contaminated from incident(s) occurring at the site evaluated. File data for the remaining one site indicated that contamination may have originated off-site.

B.8.4.1 Tabulation of Media Exposed to Contamination. Table B.8-3 summarizes the total number of DISF responses indicating contamination or the absence of contamination found by media. Site files not containing sufficient information to determine contamination were also recorded for each of the media evaluated and noted under the appropriate heading in Table B.8-3. This table indicates that 31 percent of the contamination incidents occurred to surface water. The remaining incidents occurred to either soil (29 percent), groundwater (28 percent) or air (12 percent). In many cases, contamination to more than one media occurred at any particular site.

B.8.4.2 Tabulation of Media Exposed to Contamination Incidents by Facility Type. Table B.8-4 summarizes the total number of DISF responses indicating media contamination associated with each facility type. This analysis suggests that approximately 68 percent of the sites associated with contamination incidents were identified as either surface impoundments (29 percent), landfills (24 percent), containers (11 percent), or tanks (4 percent). Table B.8-4 indicates that, for most of the incidents tabulated, in decreasing order of occurrence, contamination to:

Table B.8-1

USEPA REGION VIII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITE DESCRIPTIONS BY TYPE

Facility Type	Total Number of Responses Described as Given Facility Type	Percent of Total
Landfill	12	24
Open Dump	1	2
Surface Impoundment	12	24
Land Treatment	1	2
Storage/Treatment Containers	4	8
Storage/Treatment Tanks	3	6
Storage/Treatment Piles	4	8
Recycling/Reclamation	3	6
Midnight Dump	1	2
Radiation Sites	6	12
Other	3	6
Total	50	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.8-2

USEPA REGION VIII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[1]

TABULATION OF SITES EXPOSED TO CONTAMINATION INCIDENTS

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented contamination (to at least one medium)	27	67.5
2	Sites indicating suspected contamination (to at least one medium) and not identified by Category 1 above	7	17.5
3	Sites indicating documented or suspected absence of contamination and not identified by Categories 1 and 2 above	3	7.5
4	Sites for which there was an absence of sufficient information in the file to make a determination of contamination, and not identified by Categories 1, 2 or 3 above	3	7.5
TOTAL SITES		40	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.8-3

USEPA REGION VIII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT

Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
	Documented	Suspected	Documented	Suspected		
Groundwater	9	15	0	7	9	40
Surface Water	12	14	2	5	7	40
Air	6	4	0	14	16	40
Soil	13	12	0	5	10	40

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.8-4

USEPA REGION VIII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT BY FACILITY TYPE

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Landfill	Groundwater	5	3	0	4	0	12
	Surface Water	2	6	1	2	1	12
	Air	5	0	0	4	3	12
	Soil	2	4	0	3	3	12
Open Dump	Groundwater	0	0	0	3	1	1
	Surface Water	1	0	0	0	0	1
	Air	0	0	0	1	0	1
	Soil	1	0	0	0	0	1
Surface Impoundment	Groundwater	3	7	0	0	2	12
	Surface Water	7	2	1	1	1	12
	Air	1	1	0	4	6	12
	Soil	1	4	0	2	5	12
Incinerator(2)	Groundwater						
	Surface Water						
	Air						
	Soil						

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

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Table B.8-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Injection Well(2)	Groundwater						
	Surface Water						
	Air						
	Soil						
Land Treatment	Groundwater	0	0	0	1	0	1
	Surface Water	0	0	0	1	0	1
	Air	0	0	0	1	0	1
	Soil	0	0	0	1	0	1
Transportation(2) Spill Site	Groundwater						
	Surface Water						
	Air						
	Soil						
Storage Treatment Containers	Groundwater	0	2	0	0	2	4
	Surface Water	1	1	0	0	2	4
	Air	0	2	0	0	2	4
	Soil	3	0	0	1	1	4
Storage Treatment Tanks	Groundwater	0	1	0	0	2	3
	Surface Water	0	1	0	0	2	3
	Air	0	0	0	0	3	3
	Soil	0	1	0	0	2	3

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.8-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination Doc.	Responses Indicating Contamination Susp.	Responses Indicating No Contamination Doc.	Responses Indicating No Contamination Susp.	Insufficient Information Available in File	Total Responses
Boilers Using Waste as Fuel(2)	Groundwater						
	Surface Water						
	Air						
	Soil						
Storage Treatment Piles	Groundwater	1	2	0	0	1	4
	Surface Water	2	2	0	0	0	4
	Air	1	0	0	3	0	4
	Soil	2	2	0	0	0	4
Recycling Reclamation	Groundwater	0	1	0	0	2	3
	Surface Water	0	1	0	0	2	3
	Air	0	2	0	0	1	3
	Soil	0	0	0	0	1	3
Midnight Dump	Groundwater	0	0	0	0	1	1
	Surface Water	0	0	0	0	0	1
	Air	0	0	0	1	0	1
	Soil	1	0	0	0	0	1
Radiation	Groundwater	0	1	0	2	3	6
	Surface Water	0	1	0	2	3	6
	Air	1	1	0	0	4	6
	Soil	3	0	0	0	3	6

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

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- groundwater was associated with landfills, surface impoundment, containers, and piles;
- surface water was associated with landfills, surface impoundments, containers, piles, and other types;
- soil was associated with landfills, surface impoundments, containers, piles, radiation sites, and other sites; and
- air was associated with landfills, surface impoundments, containers, recycling/reclamation, and radiation sites.

B.8.5 Events Causing Contamination. Contaminated sites were associated with one or more of the following events, as outlined in Section VIII of the DISF.

- Fire/Explosion
- Spill
- Leak
- Flood
- Seismic Activity
- Erosion
- Leachate
- Emission of Toxic Gases/Mists

In the remainder of this section, events tabulated will include both documented and suspected events, unless otherwise noted.

Seven of these events were identified at least once, along with one other type not listed in the DISF. This other event was described as radiation exposure. A total of 11 sites (28 percent) were involved in two events and 8 sites (20 percent) in three or more events.

B.8.5.1 Tabulation of Events Causing Contamination Incidents. Table B.8-5 summarizes the total number of events causing contamination incidents. In total, 68 contamination events involving various facility types were recorded in the DISFs. For this region, this tabulation indicates that approximately 66 percent of the contamination events were related to leachate (32 percent), others (18 percent) or leaks (16 percent). Of the 68 contamination events tabulated, 43 (63 percent) could be documented from information available in the file.

B.8.5.2 Tabulation of Events Causing Contamination Incidents By Facility Type. Table B.8-6 summarizes the events causing contamination incidents at various facility types. Since a number of sites contained a multiple number of facilities, there were a number of cases where there was insufficient information available in the file to identify the damage incident with the specific facility unit in question. These represented approximately 5 percent of the total and are identified in Table B.8-6.

This analysis indicates that approximately 86 percent of the leachate events were associated with landfills (50 percent) or surface impoundments (36 percent). Leaks were found to occur at approximately one quarter of the facilities while 50 percent were associated with surface impoundments. Approximately 60 percent of the fire/explosion events were associated with storage or treatment facilities (all types) (40 percent) and landfills (20 percent). Air pollution events, i.e., emissions of toxic gases and mists, were associated with containers (60 percent) and landfills (40 percent). Facilities having the highest frequency of fires and explosions were containers (29 percent), and landfills (29 percent).

Table B.8-5

USEPA REGION VIII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS

Event	Documented	Suspected	Total
Fire/Explosion	5	1	6
Spills	2	1	3
Leaks	7	4	11
Flood	1	0	1
Seismic Activity	0	0	0
Erosion	2	4	6
Leachate	10	12	22
Emission of Toxic Gases/Mists	5	2	7
Other	11	1	12
Total	43	25	68

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.8-6

USEPA REGION VIII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS BY FACILITY TYPE

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Landfill	Fire/Explosion	1	1	0	2
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	1	0	0	1
	Leachate	5	6	0	11
	Emission of Toxic Gases/Mists	2	0	0	2
	Other	2	0	0	2
Open Dump	Fire/Explosion	1	0	0	1
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	1	0	1
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Surface Impoundments	Fire/Explosion	0	0	0	0
	Spills	1	1	0	2
	Leaks	4	3	0	7
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	1	1	0	2
	Leachate	4	4	0	8
	Emission of Toxic Gases/Mists	0	2	0	2
	Other	0	0	0	0

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.8-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Incinerator(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				
Injection Well(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				
Land Treatment(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				
Transportation Spill Site(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.8-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Storage Treatment Containers	Fire/Explosion	2	0	0	2
	Spills	1	0	1	2
	Leaks	2	0	1	3
	Flood	1	0	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	1	2	0	3
	Other	1	0	0	1
Storage Treatment Tanks	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	2	1	3
	Flood	0	1	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	1	1	2
	Other	0	0	0	0
Storage Treatment Piles	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	1	2	0	3
	Leachate	1	2	0	3
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	0	1	0	1
Boilers Using Waste as Fuel(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.8-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Recycling Reclamation	Fire/Explosion	1	0	0	1
	Spills	1	0	1	2
	Leaks	1	0	1	2
	Flood	1	0	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	1	1	0	2
	Other	1	0	0	1
Midnight Dump	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	1	0	1
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Radiation Site	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	6	1	0	7

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

B.8.6 Chemicals Documented in Contamination Incidents. For this analysis, chemical compounds were organized into the following general categories:

- Volatile Halogenated Organics (VHOs)
- Volatile Non-halogenated Organics (VNHOs)
- Base Neutral Extractables (BNEs)
- Pesticides
- PCBs
- Metals
- Oil
- Ammonia/Ammonia Compounds
- Asbestos
- Inorganics
- Cyanide
- Acids
- Acid Compounds
- Alkalies
- Alcohols
- Aldehydes
- Ketones
- Radioactive

Table B.8-7 summarizes the total number of times that a chemical in a given category was positively identified by sampling and analytical techniques as occurring as contaminants in the various media.

Eleven of these chemical categories were identified at least once, along with one additional "other" category not listed above. This tabulation indicates that approximately 52 percent of the chemical categories were identified as either metals (25 percent), VHOs (14 percent), or VNHOs (13 percent). Table B.8-8 lists the most commonly occurring chemicals found in each of these categories, and the range of concentrations observed in the affected media.

B.8.7 Damage Incidents. The following six affected areas were evaluated for site related damage on the DISF.

- Drinking Water
- Food Chain
- Flora
- Fauna
- Human Health
- Property Damage

In the remainder of this section damage will be interpreted to mean both documented and suspected incidents/events unless otherwise noted.

Damage was identified for at least 24 sites, or 60 percent, of the sites evaluated. As noted in Section B.8.4, higher percentage of the sites indicated contamination (85 percent). Damage was indicated in approximately 70 percent of the contaminated sites evaluated. Of the 46 affected areas indicating damage, only 19 (41 percent) could be documented using the evaluation criteria.

Sites indicating the absence of damage, and/or files not containing sufficient information to determine damage, were also identified. A tabulation of sites identified with damage for at least one of the above categories is outlined in Table B.8-9. Of note, are the 12 sites (30 percent) identified as having damage to two or more affected areas. Of the 25 sites indicating soil contamination, 6 sites also indicated damage to drinking water. Also, of the 30 sites indicating soil and/or surface water contamination, 10 sites also indicated damage to flora, fauna or the food chain.

Table B.8-7

USEPA REGION VIII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF CHEMICALS DOCUMENTED IN CONTAMINATION INCIDENTS

Chemical Category	Total Positive Identifications	Percent of Total
Volatile Halogenated Organics (VHOs)	8	14
Volatile Non-halogenated Organics (VNHOs)	7	13
Base Neutral Extractables (BNEs)	1	2
Pesticides	5	9
PCBs	2	4
Metals	14	25
Oil	2	4
Ammonia/Ammonia Compounds	0	0
Inorganics	3	5
Cyanide	0	0
Acids	3	5
Acid Compounds	4	7
Alkalies	0	0
Alcohols	0	0
Aldehydes	0	0
Ketones	0	0
Radioactive	6	11
Asbestos	0	0
Others	1	2
Total	56	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.8-8

USEPA REGION VIII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

CONCENTRATION OF SELECTED CONTAMINANTS IDENTIFIED BY MEDIA

Most Frequently Observed Chemical Category	Contaminant	Contaminant Concentration Range			
		Groundwater (mg/l)	Surface Water (mg/l)	Soil (mg/kg)	Air (mg/l)
VHOs	1,1,1 trichloroethane	ND	ND	ND	1062.8
	chlorobenzene	0.177	0.02	ND	ND
VNHOs	benzene	3.5 -65.7	0.041	ND	ND
	toluene	7.4 -64.8	0.05	ND	719
Metals	lead	ND	0.11- 0.18	trace-1,300	ND
	mercury	ND	trace-0.001	trace- 734	ND
	chromium	63.5	0.22	522	ND
	arsenic	ND	trace-7.9	trace- 510	ND

NOTES:

ND = no data available

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Sections 3.1.1 and 3.2.1.

Table B.8-9

USEPA REGION VIII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES DAMAGED

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented damage (to at least one affected area)	14	35
2	Sites indicating suspected damage (to at least one affected area) and not identified by Category 1 above	10	25
3	Sites indicating documented or suspected absence of damage and not identified by Categories 1 and 2 above	8	20
4	Sites for which there was an absence of sufficient information in the file to make a determination of damage and not identified by Categories 1,2 and 3 above	8	20
	TOTAL SITES	40	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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B.8.7.1 Tabulation of Number, Type and Severity of Damage Incidents. Table B.8-10 summarizes the total number of DISF responses indicating damage to the above affected areas. Site files not containing sufficient information to determine damage were also recorded and noted under the appropriate heading in Table B.8-10.

Table B.8-10 indicates that 58 percent of the documented damage incidents occurred to property with the remaining incidents occurring to human health (16 percent), fauna (11 percent), drinking water (11 percent), and food chain (5 percent).

Table B.8-10 indicates that of the 40 sites evaluated, 11 sites (28 percent) indicated high environmental damage, 4 sites (10 percent) indicated medium environmental damage and 8 sites (20 percent) indicated low environmental damage. The remaining 17 site files indicated no apparent damage (20 percent) or did not have enough information available (23 percent) to make an evaluation. Of note, are the files associated with the 9 sites (23 percent) which suggested that the actual damage may be higher than the response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

The analysis also indicated that out of the 40 sites evaluated, one site (3 percent) indicated high human health damage, 1 site (3 percent) indicated medium human health damage and no site indicated low human health damage. The remaining 38 sites indicated no apparent damage (i.e. there was no data available on public health damages) (48 percent) or while there was some data, there was not enough information available to make an evaluation (48 percent). Of note, are the files associated with 19 sites (48 percent) which suggested that the actual human health damage may be higher than the severity response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

B.8.7.2 Tabulation of Number and Severity of Damage Incidents by Facility Type. Table B.8-11 summarizes the DISF responses indicating damage to each affected area by associated facility type. This analysis indicates that approximately 63 percent of the damage incidents were associated with surface impoundments (48 percent), storage facilities (8 percent) or landfills (7 percent). The remaining 37 percent of the damage incidents were associated with piles, radiation sites, recycling/reclamation, and land treatment.

Table B.8-11 also indicates that 80 percent of the incidents involving damage to drinking water involved surface impoundments (60 percent) and landfills (20 percent).

Table B.8-11 also identifies the severity of damage to environment and/or human health. Landfills, storage facilities and surface impoundments resulted in 80 percent of the cases involving high or medium environmental damage and 100 percent of the cases involving high or medium human health damage.

B.8.8 Status of Response. Table B.8-12 summarizes the status of each site evaluated from the standpoint of enforcement, investigative and remedial activites. This table indicates that only 20 percent of the files

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Table B.8-10

USEPA REGION VIII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[1]

TABULATION OF NUMBER & SEVERITY OF DAMAGE INCIDENTS

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	2	4	3	19	12	40
Food Chain	1	5	0	19	15	40
Flora	0	5	1	14	20	40
Fauna	2	5	0	13	20	40
Human Health	3	2	0	23	12	40
Property Damage	11	6	1	12	10	40

	Severity of Damage					
Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	11	4	8	9	8	40
Human Health	1	1	0	19	19	40

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.8-11

USEPA REGION VIII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY DAMAGE INCIDENTS BY FACILITY TYPE

Landfill

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	1	0	1	7	3	12
Food Chain	0	0	0	8	4	12
Flora	0	0	1	5	6	12
Fauna	0	0	0	6	6	12
Human Health	1	0	0	7	4	12
Property Damage	1	1	1	5	3	12

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	4	1	1	3	3	12
Human Health	0	0	0	4	8	12

Open Dump

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	0	1	1
Food Chain	0	0	0	0	1	1
Flora	0	0	0	0	1	1
Fauna	0	0	0	0	1	1
Human Health	0	0	0	0	1	1
Property Damage	1	0	0	0	0	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	1	4	0	0	1
Human Health	0	0	0	1	0	1

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.8-11 (cont'd)

Surface Impoundments

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	1	2	1	7	1	12
Food Chain	0	5	0	5	2	12
Flora	0	5	0	4	3	12
Fauna	0	4	0	4	4	12
Human Health	0	1	0	9	2	12
Property Damage	2	3	0	4	3	12

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	3	1	4	3	1	12
Human Health	0	0	0	3	9	12

Incinerator(2)

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.8-11 (cont'd)(1)

Injection Well(2)

	Damage		No Damage		Insufficient Information Available in File	
Affected Area	Documented	Suspected	Documented	Suspected		Total
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

Land Treatment

	Damage		No Damage		Insufficient Information Available in File	
Affected Area	Documented	Suspected	Documented	Suspected		Total
Drinking Water	0	0	0	1	0	1
Food Chain	0	0	0	1	0	1
Flora	0	0	0	1	0	1
Fauna	0	0	0	1	0	1
Human Health	0	0	0	1	0	1
Property Damage	0	0	0	1	0	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	0	1	1
Human Health	0	0	0	0	1	1

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated

Table B.8-11 (cont'd)(1)

Transportation Spill Site(2)

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

Storage Treatment Containers

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	3	1	4
Food Chain	0	0	0	3	1	4
Flora	0	0	0	1	3	4
Fauna	0	0	0	1	3	4
Human Health	1	0	0	2	1	4
Property Damage	2	0	0	0	2	4

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	1	1	1	0	4
Human Health	0	1	1	1	2	4

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.8-11 (cont'd)(1)

Storage Treatment Tanks

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	2	1	3
Food Chain	0	0	0	2	1	3
Flora	0	0	0	0	3	3
Fauna	0	0	0	0	3	3
Human Health	0	0	0	1	2	3
Property Damage	0	1	0	0	2	3

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	3	0	3
Human Health	0	0	0	2	1	3

Storage Treatment Piles

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	2	0	2	4
Food Chain	0	2	0	1	1	4
Flora	0	1	0	1	2	4
Fauna	0	2	0	2	1	4
Human Health	0	1	0	0	1	4
Property Damage	3	0	0	0	1	4

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	1	1	1	0	4
Human Health	0	0	0	3	1	4

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.8-11 (cont'd)(1)

Boilers Using Waste as Fuel(2)

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

Recycling/Reclamation

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	2	1	3
Food Chain	0	0	0	2	1	3
Flora	0	0	0	1	2	3
Fauna	0	0	0	1	2	3
Human Health	1	0	0	1	1	3
Property Damage	1	0	0	0	2	3

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	1	1	1	0	3
Human Health	0	1	0	1	1	3

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.8-11 (cont'd)(1)

Midnight Dump

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	0	1	1
Food Chain	1	0	0	0	0	1
Flora	0	0	0	0	1	1
Fauna	1	0	0	0	0	1
Human Health	1	0	0	0	0	1
Property Damage	1	0	0	0	0	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	1	0	0	1
Human Health	1	0	0	0	0	1

Other

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	3	3	6
Food Chain	0	0	0	3	3	6
Flora	0	0	0	3	3	6
Fauna	0	0	0	3	3	6
Human Health	0	1	0	0	5	6
Property	3	3	0	0	0	6

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	1	3	2	6
Human Health	0	0	0	6	0	6

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.8-12

USEPA REGION VIII
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

STATUS OF RESPONSE

Total Number of Sites...

...evaluated	...with legal/ enforcement action underway/completed	...with investigative actions underway/completed	...with remedial actions underway/completed
40	8	17	18

DESCRIPTION OF REMEDIAL ACTIVITY

Damage Incident	Facility type	Location	Remedial Activity	Costs ($)
1. Groundwater contamination from leachate.	LF	Lyons, Colorado.	Installation of runoff diversion drains, sumps, and clay cap	300,000
2. Property damage.	OD, STP	Commerce City, Colorado.	Excavation of contaminated soil, neutralization, and clay cap (proposed)	700,000

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

evaluated indicated that the sites identified were involved in either past or present legal or enforcement actions. However, 17 (43 percent) site files indicated that additional environmental investigations were in progress or completed. Eighteen (45 percent) sites were reported to be involved with past or present remedial activities.

Table B.8-12 also compares the damage incident type with the remedial activities and related costs for sites having cost data available. These activities included excavation of contaminated soil, leachate collection, neutralization, installation of liners, etc. Expenditures for remedial activities for the sites ranged from $300,000 to $700,000.

Section B.9

B.9 Region IX Summary

B.9.1 Region IX Overview. The study team evaluated and completed DISFs for 44 sites in Region IX. Many of these sites contained multiple facilities. A total of 80 facility types were used in describing the sites in this region. Of the 80 facility types evaluated, 26 percent were containers, 25 percent were surface impoundments, 15 percent were tanks and 12 percent were landfills. The remaining 22 percent of the facility types were described by various other categories. As discussed in Sections 3.1 and 3.2 the reader should note for the following discussion that the data bases and the selection criteria utilized on this study limit the applicability of the conclusions reached herein to other populations of hazardous waste sites.

Contamination, either documented or suspected, was identified in 40 sites, or 91 percent of the sites evaluated. At 26 of the sites, or 59 percent, contamination was documented. Forty percent of the contamination incidents occurred to soil, with the remaining incidents occurring to groundwater (34 percent), surface water (16 percent) and air (10 percent). Of the 88 responses originally indicating contamination only 33 (38 percent) could be documented using the evaluation criteria developed in Section 3.1.4. Each site was evaluated for damage occurring to life, property, and various natural resources. This evaluation focused on six potentially affected areas, including drinking water, food chain, flora, fauna, human health and property. Damage, (either documented or suspected), was identified in 23 sites, or 52 percent of the sites evaluated. Of the 40 affected areas originally indicating damage only 21 (53 percent) could be documented using the evaluation criteria. Approximately 29 percent of the documented damage incidents occurred to drinking water, with the remaining incidents occurring to property (24 percent), fauna (19 percent), food chain (14 percent), flora (9 percent) and human health (5 percent). There was one incident involving documented damage to human health. This incident involved a serious illness attributed to direct contact with contamination. Seventy-one percent of the incidents causing the damage or contamination described above were due to leachate (29 percent), leaks (25 percent) or spills (17 percent). These incidents involved contamination caused by metals, acid compounds or volatile halogenated organics in 81 percent of the incidents tabulated.

B.9.2 Sources. The study team preliminarily identified 62 types of files in Region IX for review. File sources included 32 FIT files, 13 S&A files, 8 Uncontrolled Hazardous Waste Site files, 8 Enforcement files and 1 Waste Division Inspection file. Fourteen files were not reviewed because EPA had negotiated a confidentiality agreement with the site owners. Based upon a review of the remaining 48 sites, 4 were eliminated from the study because they did not conform to the Selection Criteria summarized in Section 3.1, Table 3-1.

B.9.3 Tabulation of Site Descriptions by Facility Type. Each site was evaluated and categorized by one or more of the following fourteen site descriptions as listed in Section IIA of the DISFs.

- Landfill Facility
- Open Dump
- Surface Impoundment
- Incinerator
- Storage/Treatment Containers
- Storage/Treatment Tanks
- Storage/Treatment Piles
- Boilers Using Waste as Fuel

. Injection Well	. Recycling/Reclamation
. Land Treatment	. Midnight Dump
. Transportation Spill Site	. Other

For the 44 sites evaluated in the region, 11 of these categories were identified at least once. Table B.9-1 summarizes the total number of facility types used in describing the 44 sites evaluated. Many of these sites contained multiple facilities. A total of 80 facility types were used in describing this region. Of the 80 facility types evaluated, approximately 80 percent of the sites were identified as either containers (26 percent), surface impoundments (25 percent), tanks (15 percent) or landfills (12 percent). A total of 24 sites were described by 2 or more facility types and 10 sites by three or more facility types.

B.9.4 Contamination Incidents. Four media, i.e. groundwater, surface water, air and soil, were evaluated for site-related contamination in Section V of the DISF. In the remainder of this section, contamination will be interpreted to mean both documented and suspected incidents/events, unless otherwise noted. Sites indicating the absence of contamination, and/or files not containing sufficient information to determine the presence of contamination, were also identified. Table B.9-2 summarizes the number of sites identified with contamination in at least one of the above media.

Contamination incidents were identified at 40 of the sites evaluated. A total of 88 incidents involving various media were recorded at these sites of which 33 (38 percent) could be documented by sampling and analytical data. Thirty-four sites were identified with contamination in two or more media. For example, of the 35 sites indicating soil contamination, 28 sites also indicated groundwater contamination. File data indicated that 37 sites were contaminated from incident(s) occurring at the site evaluated. File data for the remaining 3 sites indicated that contamination may have originated off-site.

B.9.4.1 Tabulation of Media Exposed to Contamination. Table B.9-3 summarizes the total number of DISF responses indicating contamination or the absence of contamination found by media. Site files not containing sufficient information to determine contamination were also recorded for each of the media evaluated and noted under the appropriate heading in Table B.9-3. This table indicates that 40 percent of the contamination incidents occurred to soil. The remaining incidents occurred to either groundwater (34 percent), surface water (16 percent) or air (10 percent). In many cases, contamination to more than one media occurred at any particular site.

B.9.4.2 Tabulation of Media Exposed to Contamination Incidents by Facility Type. Table B.9-4 summarizes the total number of DISF responses indicating media contamination associated with each facility type. This analysis suggests that approximately 85 percent of the sites associated with contamination incidents were identified as either surface impoundments (28 percent), containers (19 percent), tanks (16 percent), landfills (13 percent) or open dumps (9 percent). Table B.9-4 indicates that, for most of the incidents tabulated, in decreasing order of occurrence, contamination to:

Table B.9-1

USEPA REGION IX
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITE DESCRIPTIONS BY TYPE

Facility Type	Total Number of Responses Described as Given Facility Type	Percent of Total
Landfill	10	12
Open Dump	6	8
Surface Impoundment	20	25
Injection Well	2	3
Land Treatment	2	3
Transportation Spill Site	1	1
Storage/Treatment Containers	21	26
Storage/Treatment Tanks	12	15
Storage/Treatment Piles	3	4
Recycling/Reclamation	2	3
Midnight Dump	1	1
Total	80	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.9-2

USEPA REGION IX
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES EXPOSED TO CONTAMINATION INCIDENTS

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented contamination (to at least one medium)	26	59
2	Sites indicating suspected contamination (to at least one medium) and not identified by Category 1 above	14	32
3	Sites indicating documented or suspected absence of contamination and not identified by Categories 1 and 2 above	1	2
4	Sites for which there was an absence of sufficient information in the file to make a determination of contamination, and not identified by Categories 1, 2 or 3 above	3	7
	TOTAL SITES	44	100

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.9-3

USEPA REGION IX
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT

Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
	Documented	Suspected	Documented	Suspected		
Groundwater	11	19	2	2	10	44
Surface Water	4	10	0	2	28	44
Air	2	7	0	7	28	44
Soil	16	19	1	1	7	44

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.9-4

USEPA REGION IX
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT BY FACILITY TYPE

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Landfill	Groundwater	3	3	1	0	3	10
	Surface Water	1	2	0	0	7	10
	Air	2	2	0	1	6	10
	Soil	0	8	0	0	2	10
Open Dump	Groundwater	1	4	1	0	0	6
	Surface Water	1	2	0	0	3	6
	Air	0	1	0	2	3	6
	Soil	3	2	0	0	1	6
Surface Impoundment	Groundwater	8	9	1	1	1	20
	Surface Water	0	5	0	2	13	20
	Air	0	3	0	3	14	20
	Soil	9	9	1	0	1	20
Incinerator	Groundwater	0	0	0	0	0	0
	Surface Water	0	0	0	0	0	0
	Air	0	0	0	0	0	0
	Soil	0	0	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.9-4 (cont'd)[1]

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Injection Well	Groundwater	0	1	0	0	1	2
	Surface Water	0	0	0	1	1	2
	Air	0	0	0	1	1	2
	Soil	0	0	0	1	1	2
Land Treatment	Groundwater	0	1	0	1	0	2
	Surface Water	0	0	0	2	0	2
	Air	0	0	0	2	0	2
	Soil	0	1	0	1	0	2
Transportation Spill Site	Groundwater	0	0	0	1	0	1
	Surface Water	0	0	0	1	0	1
	Air	0	1	0	0	0	1
	Soil	0	1	0	0	0	1
Storage Treatment Containers	Groundwater	0	9	1	4	7	21
	Surface Water	0	4	0	5	12	21
	Air	1	4	0	6	10	21
	Soil	5	7	0	3	6	21
Storage Treatment Tanks	Groundwater	1	7	1	0	3	12
	Surface Water	0	3	0	1	8	12
	Air	0	3	0	2	7	12
	Soil	7	4	0	0	1	12

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.9-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Storage Treatment Piles	Groundwater	0	2	0	0	1	3
	Surface Water	2	1	0	0	0	3
	Air	0	1	0	1	1	3
	Soil	2	1	0	0	0	3
Boilers Using Waste as Fuel(2)	Groundwater						
	Surface Water						
	Air						
	Soil						
Recycling Reclamation	Groundwater	0	1	1	0	0	2
	Surface Water	0	1	0	0	1	2
	Air	0	0	0	2	0	2
	Soil	2	0	0	0	0	2
Midnight Dump	Groundwater	0	1	0	0	0	1
	Surface Water	0	1	0	0	0	1
	Air	1	0	0	0	0	1
	Soil	0	1	0	0	0	1

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

- groundwater was associated with surface impoundments, containers and tanks;
- surface water was associated with surface impoundments, containers, tanks and piles;
- soil was associated with surface impoundments, containers, tanks and landfills; and
- air was associated with containers and landfills.

B.9.5 Events Causing Contamination. Contaminated sites were associated with one or more of the following events, as outlined in Section VIII of the DISF.

- Fire/Explosion
- Spill
- Leak
- Flood
- Seismic Activity
- Erosion
- Leachate
- Emission of Toxic Gases/Mists

Seven of these events were identified at least once, along with two other types not listed in the DISF. These other events were described as wastewater discharges and surface runoff. A total of 11 sites (25 percent) were involved in two events and 14 sites (32 percent) three or more events.

B.9.5.1 Tabulation of Events Causing Contamination Incidents. Table B.9-5 summarizes the total number of events causing contamination incidents. In total, 89 contamination events involving various facility types were recorded in the DISFs. For this region, this tabulation indicates that approximately 71 percent of the contamination events were related to leachate (29 percent), leaks (25 percent) or spills (17 percent). Of the 89 contamination events tabulated, 50 (56 percent) could be documented from information available in the file.

B.9.5.2 Tabulation of Events Causing Contamination Incidents By Facility Type. Table B.9-6 summarizes the events causing contamination incidents at various facility types. Since a number of sites contained a multiple number of facilities, there were a number of cases where there was insufficient information available in the file to identify the damage incident with the specific facility unit in question. These represented approximately 3 percent of the total and are identified in Table B.9-6.

This analysis indicates that approximately 83 percent of the leachate events were associated with surface impoundments (39 percent), containers (16 percent), tanks (14 percent) or landfills (14 percent). Leaks were found to occur primarily at containers and surface impoundments. Approximately 55 percent of the spill events were associated with containers (29 percent) and surface impoundments (26 percent). Air pollution events, i.e., emissions of toxic gases and mists, were most commonly associated with containers (50 percent). Facilities having the highest frequency of fires and explosions were containers (36 percent), recycling/reclamation facilities (18 percent) and tanks (18 percent).

B.9.6 Chemicals Documented in Contamination Incidents. For this analysis, chemical compounds were organized into the following general categories:

Table B.9-5

USEPA REGION IX
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS

Event	Documented	Suspected	Total
Fire/Explosion	5	1	6
Spills	12	3	15
Leaks	10	12	22
Flood	1	1	2
Seismic Activity	0	0	0
Erosion	1	1	2
Leachate	9	17	26
Emission of Toxic Gases/Mists	2	3	5
Other	10	1	11
Total	50	39	89

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.9-6

USEPA REGION IX
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS BY FACILITY TYPE

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Landfill	Fire/Explosion	0	1	0	1
	Spills	0	2	0	2
	Leaks	0	3	0	3
	Flood	0	1	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	1	0	1
	Leachate	0	7	0	7
	Emission of Toxic Gases/Mists	1	0	0	1
	Other	0	1	0	1
Open Dump	Fire/Explosion	0	1	0	1
	Spills	1	1	0	2
	Leaks	1	1	0	2
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	1	0	0	1
	Leachate	2	1	0	3
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	3	0	0	3
Surface Impoundments	Fire/Explosion	0	0	0	0
	Spills	4	4	0	8
	Leaks	4	10	0	14
	Flood	1	0	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	6	13	0	19
	Emission of Toxic Gases/Mists	0	1	0	1
	Other	0	1	0	1

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.9-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Incinerator(2)	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Injection Well	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Land Treatment	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Transportation Spill Site	Fire/Explosion	0	0	0	0
	Spills	1	0	0	1
	Leaks	1	0	0	1
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	1	0	0	1

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.9-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Storage Treatment Containers	Fire/Explosion	3	1	0	4
	Spills	5	4	0	9
	Leaks	5	6	0	11
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	2	6	0	8
	Emission of Toxic Gases/Mists	1	2	0	3
	Other	2	0	0	2
Storage Treatment Tanks	Fire/Explosion	1	0	1	2
	Spills	3	3	0	6
	Leaks	4	1	1	6
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	2	4	1	7
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Storage Treatment Piles	Fire/Explosion	0	0	0	0
	Spills	1	0	0	1
	Leaks	1	0	0	1
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	2	0	0	2
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	4	0	0	4
Boilers Using Waste as Fuel(2)	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.9-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Recycling Reclamation	Fire/Explosion	2	0	0	2
	Spills	1	0	0	1
	Leaks	1	0	0	1
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	0	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	1	0	0	1
Midnight Dump	Fire/Explosion	1	0	0	1
	Spills	1	0	0	1
	Leaks	1	0	0	1
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	1	0	0	1
	Other	1	0	0	1

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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- Volatile Halogenated Organics (VHOs)
- Volatile Non-halogenated Organics (VNHOs)
- Base Neutral Extractables (BNEs)
- Pesticides
- PCBs
- Metals
- Oil
- Ammonia/Ammonia compounds
- Asbestos
- Inorganics
- Cyanide
- Acids
- Acid Compounds
- Alkalies
- Alcohols
- Aldehydes
- Ketones
- Radioactive

Table B.9-7 summarizes the total number of times that a chemical in a given category was positively identified by sampling and analytical techniques as occurring as contaminants in the various media.

Twelve of these chemical categories were identified at least once. This tabulation indicates that approximately 82 percent of the chemical categories were identified as either metals (58 percent), acid compounds (13 percent) or VHOs (10 percent). Table B.9-8 lists the most commonly occurring chemicals found in each of these categories, and the range of concentrations observed in the affected media.

B.9.7 Damage Incidents. The following six affected areas were evaluated for site related damage on the DISF.

- Drinking Water
- Food Chain
- Flora
- Fauna
- Human Health
- Property Damage

In the remainder of this section damage will be interpreted to mean both documented and suspected incidents/events unless otherwise noted.

Damage was identified for at least 23 sites, or 52 percent, of the sites evaluated. As noted in Section B.9.4, higher percentages of the sites indicated contamination (91 percent). Damage was indicated in approximately 26 percent of the contaminated sites evaluated. Of the 40 affected areas indicating damage, only 21 (53 percent) could be documented using the evaluation criteria.

Sites indicating the absence of damage, and/or files not containing sufficient information to determine damage, were also identified. A tabulation of sites identified with damage for at least one of the above categories is outlined in Table B.9-9. Of note are the 10 sites (23 percent) identified as having damage to two or more affected areas. Of the 35 sites indicating soil contamination, 13 sites also indicated in damage to drinking water. Also, of the 37 sites indicating soil and/or surface water contamination, 6 sites also indicated damage to flora, fauna or the food chain.

B.9.7.1 Tabulation of Number, Type and Severity of Damage Incidents. Table B.9-10 summarizes the total number of DISF responses indicating damage to the above affected areas. Site files not containing sufficient information to determine damage were also recorded and noted under the appropriate heading in Table B.9-10.

Table B.9-7

USEPA REGION IX
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF CHEMICALS DOCUMENTED IN CONTAMINATION INCIDENTS

Chemical Category	Total Positive Identifications	Percent of Total
Volatile Halogenated Organics (VHOs)	4	10
Volatile Non-halogenated Organics (VNHOs)	0	0
Base Neutral Extractables (BNEs)	0	0
Pesticides	1	3
PCBs	3	8
Metals	22	58
Oil	0	0
Ammonia/Ammonia Compounds	0	0
Inorganics	3	8
Cyanide	0	0
Acids	0	0
Acid Compounds	5	13
Alkalies	0	0
Alcohols	0	0
Aldehydes	0	0
Ketones	0	0
Radioactive	0	0
Asbestos	0	0
Others	0	0
Total	38	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.9-8

USEPA REGION IX
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

CONCENTRATION OF SELECTED CONTAMINANTS IDENTIFIED BY MEDIA

Most Frequently Observed Chemical Category	Contaminant	Contaminant Concentration Range			
		Groundwater (mg/l)	Surface Water (mg/l)	Soil (mg/kg)	Air (mg/l)
Metals	arsenic	0.001- 0.36	15 - 16	0.25- 500	ND
	cadmium	0.02- 0.1	0.15-1.0	4.1	ND
	lead	ND	4.5	9- 12,000	ND
VHOs	tricholoroethylene	0.077-715.0	ND	1.1	ND
	1,1,1 trichloroethane	0.02- 1.2	ND	1.4	ND
	1,1 dichloroethylene	0.01- 2.6	ND	ND	ND
Acid Compounds	phenols	0.02- 0.03	ND	0.7- 2.51	ND
	pentachlorophenol	0.0003	ND	0.002-3100.	ND

NOTES:

ND = no data available

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.9-9

USEPA REGION IX
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES DAMAGED

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented damage (to at least one affected area)	14	32
2	Sites indicating suspected damage (to at least one affected area) and not identified by Category 1 above	9	20
3	Sites indicating documented or suspected absence of damage and not identified by Categories 1 and 2 above	16	36
4	Sites for which there was an absence of sufficient information in the file to make a determination of damage and not identified by Categories 1,2 and 3 above	5	11
	TOTAL SITES	44	100

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.9-10

USEPA REGION IX
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY OF DAMAGE INCIDENTS

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	6	7	3	10	18	44
Food Chain	3	2	0	26	13	44
Flora	2	1	0	30	11	44
Fauna	4	1	0	26	13	44
Human Health	1	8	0	13	22	44
Property Damage	5	0	0	13	26	44

	Severity of Damage					
Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	9	8	13	6	8	44
Human Health	0	3	4	14	23	44

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.9-10 indicates that 29 percent of the documented damage incidents occurred to drinking water, with the remaining incidents occurring to property (24 percent) and fauna (19 percent). Documented damage to food chain, flora and human health represented the remaining 28 percent of the incidents recorded.

Table B.9-10 indicates that of the 44 sites evaluated, 9 sites (20 percent) indicated high environmental damage, 8 sites (18 percent) indicated medium environmental damage and 13 sites (30 percent) indicated low environmental damage. The remaining 14 site files indicated no apparent damage (18 percent) or did not have enough information available (14 percent) to make an evaluation. Of note, are the files associated with the 3 sites (7 percent) which suggested that the actual damage may be higher than the response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

The analysis also indicated that out of the 44 sites evaluated, no site indicated high human health damage, 3 sites (7 percent) indicated medium human health damage and 4 sites (9 percent) indicated low human health damage. The remaining 37 sites indicated no apparent damage (i.e., there was no data available on public health damages) (32 percent) or, while there was some data, there was not enough information available to make an evaluation (52 percent). Of note, are the files associated with 4 sites (9 percent) which suggested that the actual human health damage may be higher than the severity response described in the DISF, but the file contained insufficient analytical data to support a higher damage rating.

B.9.7.2 Tabulation of Number and Severity of Damage Incidents by Facility Type. Table B.9-11 summarizes the DISF responses indicating damage to each affected area by associated facility type. This analysis indicates that approximately 82 percent of the damage incidents were associated with surface impoundments (31 percent), containers (19 percent), piles (12 percent), landfills (10 percent) or open dumps (10 percent). The remaining 18 percent of the damage incidents were associated with injection wells, transportation spill sites, tanks, recycling/reclamation, and midnight dumps.

Table B.9-11 also indicates that 83 percent of the incidents involving damage to drinking water involved surface impoundments (40 percent), landfills (17 percent), open dumps (13 percent) and containers (13 percent). Table B.9-11 also identifies the severity of damage to environment and/or human health. Landfills, surface impoundments, tanks and containers resulted in 87 percent of the cases involving high or medium environmental damage and 83 percent of the cases involving high or medium human health damage.

B.9.8 Status of Response. Table B.9-12 summarizes the status of each site evaluated from the standpoint of enforcement, investigative and remedial activites. This table indicates that only 21 percent of the files evaluated indicated that the sites identified were involved in either past or present legal or enforcement actions. However, 33 (75 percent) site files indicated that additional environmental investigations were in progress or completed. Fifteen (34 percent) sites were reported to be involved with past or present remedial activities.

Table B.9-11

USEPA REGION IX HAZARDOUS WASTE SITES DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY DAMAGE INCIDENTS BY FACILITY TYPE

Landfill

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	1	3	1	1	4	10
Food Chain	0	0	0	7	3	10
Flora	0	0	0	7	3	10
Fauna	0	0	0	7	3	10
Human Health	0	2	0	2	6	10
Property Damage	0	1	0	2	7	10

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	2	3	3	2	10
Human Health	0	0	1	5	4	10

Open Dump

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	1	2	1	0	2	6
Food Chain	1	0	0	2	3	6
Flora	0	0	0	3	3	6
Fauna	1	0	0	2	3	6
Human Health	0	1	0	1	4	6
Property Damage	0	1	0	2	3	6

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	1	1	2	0	6
Human Health	0	0	2	1	3	6

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.9-11 (cont'd)(1)

Surface Impoundments

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	4	5	1	3	7	20
Food Chain	1	1	0	11	7	20
Flora	1	0	0	12	7	20
Fauna	1	1	0	12	6	20
Human Health	0	3	0	6	11	20
Property Damage	2	2	0	3	13	20

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	4	3	6	4	3	20
Human Health	0	1	1	7	11	20

Incinerator(2)

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	0	0	0
Food Chain	0	0	0	0	0	0
Flora	0	0	0	0	0	0
Fauna	0	0	0	0	0	0
Human Health	0	0	0	0	0	0
Property Damage	0	0	0	0	0	0

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	0	0	0
Human Health	0	0	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.9-11 (cont'd)[1]

Injection Well

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	1	0	0	1	2
Food Chain	0	0	0	0	2	2
Flora	0	0	0	0	2	2
Fauna	0	0	0	0	2	2
Human Health	0	0	0	0	2	2
Property Damage	0	0	0	0	2	2

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	1	1	2
Human Health	0	0	0	1	1	2

Land Treatment

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	2	0	2
Food Chain	0	0	0	2	0	2
Flora	0	0	0	2	0	2
Fauna	0	0	0	2	0	2
Human Health	0	0	0	2	0	2
Property Damage	0	0	0	2	0	2

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	0	2	2
Human Health	0	0	0	0	2	2

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.9-11 (cont'd)(1)

Transportation Spill Site

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	0	1	1
Food Chain	0	0	0	0	1	1
Flora	0	0	0	0	1	1
Fauna	0	0	0	0	1	1
Human Health	0	1	0	0	0	1
Property Damage	1	0	0	0	0	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	1	0	1
Human Health	0	0	0	1	0	1

Storage Treatment Containers

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	3	1	7	10	21
Food Chain	1	1	0	14	5	21
Flora	0	1	0	14	6	21
Fauna	1	0	0	15	5	21
Human Health	0	3	0	9	9	21
Property Damage	2	1	0	9	9	21

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	1	6	6	8	21
Human Health	0	0	1	8	12	21

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.9-11 (cont'd)(1)

Storage Treatment Tanks

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	1	1	2	8	12
Food Chain	1	0	0	7	4	12
Flora	1	0	0	7	4	12
Fauna	1	0	0	7	4	12
Human Health	0	0	0	3	9	12
Property Damage	1	0	0	2	9	12

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	2	2	6	2	12
Human Health	0	0	0	6	6	12

Storage Treatment Piles

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	2	0	0	1	3
Food Chain	1	1	0	0	1	3
Flora	0	0	0	0	3	3
Fauna	2	0	0	0	1	3
Human Health	0	2	0	0	1	3
Property Damage	0	0	0	0	3	3

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	1	1	0	0	3
Human Health	0	0	1	1	1	3

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.9-11 (cont'd)(1)

Boilers Using Waste as Fuel(2)

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

Recycling/Reclamation

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	1	0	1	2
Food Chain	0	0	0	2	0	2
Flora	0	0	0	2	0	2
Fauna	0	0	0	2	0	2
Human Health	0	0	0	1	1	2
Property Damage	1	0	0	0	1	2

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	1	0	1	0	2
Human Health	0	0	0	1	1	2

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B:9-11 (cont'd)(1)

Midnight Dump

Affected Area	Damage Documented	Damage Suspected	No Damage Documented	No Damage Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	0	1	1
Food Chain	1	0	0	0	0	1
Flora	0	0	0	0	1	1
Fauna	1	0	0	0	0	1
Human Health	0	0	0	0	1	1
Property Damage	1	0	0	0	0	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	1	0	1
Human Health	0	0	0	1	0	1

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.9-12

USEPA REGION IX
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

STATUS OF RESPONSE

Total Number of Sites...

...evaluated	...with legal/ enforcement action underway/completed	...with investigative actions underway/completed	...with remedial actions underway/completed
44	9	33	15

DESCRIPTION OF REMEDIAL ACTIVITY

	Damage Incident	Facility type	Location	Remedial Activity	Costs ($)
1.	Spill, Leak, Flood, Leachate	SI	Riverside, CA	Containment and waste removal	2-12 mil. (est.)
2.	Spill, Leak, Fire/ Explosion, Emission	STC, MD, TSS	Santa Fe Springs, CA	Drum removal	1.5 mil.

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.9-12 also compares the damage incident type with the remedial activities and related costs for sites having cost data available. These activities included removal and proper disposal of wastes and contaminated soils and proper containment. Expenditures for remedial activities for the sites ranged from $1.5 million to $12 million (est.).

Section B.10

B.10 Region X Summary

B.10.1 Region X Overview. The study team evaluated and completed DISFs for 37 sites in Region X. Many of these sites contained multiple facilities. A total of 62 facility types were used in describing the sites in this region. Of the 62 facility types evaluated, 24 percent were containers, 24 percent were landfills, 14 percent were tanks and 11 percent were surface impoundments. The remaining 27 percent of the facilities were described by various other categories. As discussed in Section 3.1 and 3.2 the reader should note for the following discussion that the data bases and the selection criteria utilized on this study limit the applicability of the conclusions reached herein to other populations of hazardous waste sites.

Contamination, either documented or suspected, was identified in at least 35 sites, or 95 percent of the sites evaluated. At 24 of the sites, or 65 percent, contamination was documented. Forty percent of the contamination incidents occurred to groundwater, with the remaining incidents occurring to soil (31 percent), surface water (24 percent) and air (5 percent). Of the 63 responses originally indicating contamination, only 37 (58 percent) could be documented using the evaluation criteria developed in Section 3.1.4. Each site was evaluated for damage occurring to life, property and various natural resources. This evaluation focused on six potentially affected areas, including drinking water, food chain, flora, fauna, human health and property. Damage, (either documented or suspected), was identified in at least 15 sites, or 41 percent of the sites evaluated. Of the 28 affected areas originally indicating damage, only 10 (36 percent) could be documented using the evaluation criteria. Approximately 40 percent of the documented damage incidents occurred to drinking water, with the remaining incidents occurring to property (30 percent), human health (10 percent), food chain (10 percent) and fauna (10 percent). There was one incident involving documented damage to human health involving workers, but was not a result of waste management practices at the site. Seventy-eight percent of the incidents causing the damage or contamination described above were due to leachate (36 percent), leaks (22 percent) or spills (20 percent). These incidents involved contamination caused by metals, volatile halogenated organics, or acid compounds, in 70 percent of the incidents tabulated.

B.10.2 Sources. The study team preliminarily identified 43 files in Region X for review. File sources included 29 FIT Files and 14 S&A Files. Six sites were eliminated from the study because they did not conform to the Selection Criteria summarized in Section 3.1, Table 3.1-1.

B.10.3 Tabulation of Site Descriptions by Facility Type. Each site was evaluated and categorized by one or more of the following fourteen site descriptions as listed in Section IIA of the DISFs.

- Landfill Facility
- Open Dump
- Surface Impoundment
- Incinerator
- Injection Well
- Land Treatment
- Transportation Spill Site
- Storage/Treatment Containers
- Storage/Treatment Tanks
- Storage/Treatment Piles
- Boilers Using Waste as Fuel
- Recycling/Reclamation
- Midnight Dump
- Other

For the 37 sites evaluated in the region, 11 of these categories were identified at least once, along with an additional 2 "other" categories not listed in the DISF. Table B.10-1 summarizes the total number of facility types used in describing the 37 sites evaluated. Many of these sites contained multiple facilities. A total of 62 facility types were used in describing the sites in this region. Of the 62 facility types evaluated, approximately 73 percent of the sites were identified as either containers (24 percent), landfills (24 percent), tanks (14 percent), or surface impoundments (11 percent). A total of 13 sites were described by 2 or more facility types and 8 sites by 3 or more facility types.

B.10.4 Contamination Incidents. Four media, i.e. groundwater, surface water, air and soil, were evaluated for site-related contamination in Section V of the DISF. In the remainder of this section, contamination will be interpreted to mean both documented and suspected incidents/events, unless otherwise noted. Sites indicating the absence of contamination, and/or files not containing sufficient information to determine the presence of contamination, were also identified. Table B.10-2 summarizes the number of sites identified with contamination in at least one of the above media.

Contamination incidents were identified at 35 sites, or 95 percent of the sites evaluated. A total of 63 incidents involving various media were recorded at these sites of which 37 (58 percent) could be documented by sampling and analytical data. Twenty-one sites were identified with contamination in two or more media. For example, of the 20 sites indicating soil contamination, 12 sites also indicated groundwater contamination. File data indicated that 33 sites were contaminated from incident(s) occurring at the site evaluated. File data for the remaining 2 sites indicated that contamination may have originated off-site.

B.10.4.1 Tabulation of Media Exposed to Contamination. Table B.10-3 summarizes the total number of DISF responses indicating contamination or the absence of contamination found by media. Site files not containing sufficient information to determine contamination were also recorded for each of the media evaluated and noted under the appropriate heading in Table B.10. This table indicates that 40 percent of the contamination incidents occurred to groundwater. The remaining incidents occurred to either soil (31 percent), surface water (24 percent), or air (5 percent).

B.10.4.2 Tabulation of Media Exposed to Contamination Incidents by Facility Type. Table B.10-4 summarizes the total number of DISF responses indicating media contamination associated with each facility type. This analysis suggests that approximately 62 percent of the sites associated with contamination incidents were identified as either containers (25 percent), landfills (24 percent), or surface impoundments (13 percent). Table B.10-4 indicates that, for most of the incidents tabulated, in decreasing order of occurrence, contamination to:

- groundwater was associated with landfills, surface impoundment, containers, tanks and recycling reclamation;
- surface water was associated with containers, landfills, surface impoundments, and open dump;
- soil was associated with containers, tanks, landfills, surface impoundments, and recycling reclamation; and
- air was associated with landfills, containers, and recycling reclamation.

Table B.10-1

USEPA REGION X
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITE DESCRIPTIONS BY TYPE

Facility Type	Total Number of Responses Described as Given Facility Type	Percent of Total
Landfill	15	24
Open Dump	2	3
Surface Impoundment	7	11
Injection Well	1	2
Land Treatment	1	2
Storage/Treatment Containers	15	24
Storage/Treatment Tanks	9	14
Storage/Treatment Piles	3	5
Boilers Using Waste as Fuel	1	2
Recycling/Reclamation	4	6
Midnight Dump	1	2
Other	3	5
Total	62	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.10-2

USEPA REGION X
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES EXPOSED TO CONTAMINATION INCIDENTS

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented contamination (to at least one medium)	24	65
2	Sites indicating suspected contamination (to at least one medium) and not identified by Category 1 above	11	30
3	Sites indicating documented or suspected absence of contamination and not identified by Categories 1 and 2 above	2	5
4	Sites for which there was an absence of sufficient information in the file to make a determination of contamination, and not identified by Categories 1, 2 or 3 above	0	0
	TOTAL SITES	37	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-3

USEPA REGION X
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT

Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
	Documented	Suspected	Documented	Suspected		
Groundwater	20	5	1	8	3	37
Surface Water	4	11	5	10	7	37
Air	2	1	0	21	13	37
Soil	11	9	2	9	6	37

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-4

USEPA REGION X
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[1]

TABULATION OF MEDIA EXPOSED TO CONTAMINATION INCIDENT BY FACILITY TYPE

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Landfill	Groundwater	10	1	1	3	0	15
	Surface Water	1	2	0	7	5	15
	Air	1	0	0	11	3	15
	Soil	2	1	2	6	4	15
Open Dump	Groundwater	0	1	0	1	0	2
	Surface Water	2	0	0	0	0	2
	Air	0	0	0	2	0	2
	Soil	0	0	0	0	2	2
Surface Impoundment	Groundwater	3	1	0	1	2	7
	Surface Water	0	3	0	1	3	7
	Air	0	0	0	4	3	7
	Soil	2	1	0	1	3	7

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-4 (cont'd)[1]

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Incinerator[2]	Groundwater						
	Surface Water						
	Air						
	Soil						
Injection Well	Groundwater	0	0	0	1	0	1
	Surface Water	0	1	0	0	0	1
	Air	0	0	0	1	0	1
	Soil	0	1	0	0	0	1
Land Treatment	Groundwater	1	0	0	0	0	1
	Surface Water	0	0	0	1	0	1
	Air	0	0	0	1	0	1
	Soil	0	0	0	1	0	1
Transportation Spill Site[1]	Groundwater						
	Surface Water						
	Air						
	Soil						
Storage Treatment Containers	Groundwater	2	2	1	6	4	15
	Surface Water	1	4	1	4	5	15
	Air	0	1	0	5	9	15
	Soil	4	5	0	3	3	15

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.10-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Storage Treatment Tanks	Groundwater	1	1	0	4	3	9
	Surface Water	0	1	2	3	3	9
	Air	0	0	0	6	3	9
	Soil	1	3	0	3	2	9
Storage Treatment Piles	Groundwater	0	1	0	1	1	3
	Surface Water	0	1	0	1	1	3
	Air	0	0	0	1	2	3
	Soil	0	2	0	0	1	3
Boilers Using Waste as Fuel	Groundwater	0	1	0	0	0	1
	Surface Water	0	0	0	0	1	1
	Air	0	0	0	0	1	1
	Soil	0	1	0	0	0	1
Recycling Reclamation	Groundwater	1	1	0	0	2	4
	Surface Water	0	1	1	0	2	4
	Air	0	1	0	1	2	4
	Soil	2	2	0	0	0	4

---

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-4 (cont'd)(1)

Facility Type	Media Exposed	Responses Indicating Contamination		Responses Indicating No Contamination		Insufficient Information Available in File	Total Responses
		Doc.	Susp.	Doc.	Susp.		
Midnight Dump	Groundwater	0	1	0	0	0	1
	Surface Water	1	0	0	0	0	1
	Air	0	0	0	1	0	1
	Soil	0	0	0	0	1	1
Other(2)	Groundwater						
	Surface Water						
	Air						
	Soil						

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

B.10.5 Events Causing Contamination. Contaminated sites were associated with one or more of the following events, as outlined in Section VIII of the DISF.

- Fire/Explosion
- Spill
- Leak
- Flood
- Seismic Activity
- Erosion
- Leachate
- Emission of Toxic Gases/Mists

In the remainder of this section, events tabulated will include both documented and suspected events, unless otherwise noted.

Seven of these events were identified at least once, along with three other types not listed in the DISF. These other events were described as a wastewater discharge, uncontrolled surface runoff, and drain overflow. A total of 8 sites (22 percent) were involved in two events and 9 sites (24 percent) three or more events.

B.10.5.1 Tabulation of Events Causing Contamination Incidents. Table B.10-5 summarizes the total number of events causing contamination incidents. In total, 64 contamination events involving various facility types were recorded in the DISFs. For this region, this tabulation indicates that approximately 78 percent of the contamination events were related to leachate (36 percent), leaks (22 percent) or spills (20 percent). Of the 64 contaminated events tabulated, 32 (50 percent) could be documented from information available in the file.

B.10.5.2 Tabulation of Events Causing Contamination Incidents By Facility Type. Table B.10-6 summarizes the events causing contamination incidents at various facility types. Since a number of sites contained a multiple number of facilities, there were a number of cases where there was insufficient information available in the file to identify the damage incident with the specific facility unit in question. These represented approximately 1 percent of the total and are identified in Table B.10-6.

This analysis indicates that approximately 70 percent of the leachate events were associated with landfills (52 percent), open dumps (9 percent) or surface impoundments (9 percent). Leaks were found to occur primarily at container storage facilities. Approximately 78 percent of the spill events were associated with storage or treatment facilities (all types) (61 percent) and surface impoundments (17 percent).

B.10-6 Chemicals Documented in Contamination Incidents. For this analysis, chemical compounds were organized into the following general categories:

- Volatile Halogenated Organics (VHOs)
- Volatile Non-halogenated Organics (VNHOs)
- Base Neutral Extractables (BNEs)
- Pesticides
- PCBs
- Metals
- Oil
- Ammonia/Ammonia Compounds
- Asbestos
- Inorganics
- Cyanide
- Acids
- Acid Compounds
- Alkalies
- Alcohols
- Aldehydes
- Ketones
- Radioactive

Table B.10-5

USEPA REGION X
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS

Event	Documented	Suspected	Total
Fire/Explosion	1	0	1
Spills	7	6	13
Leaks	7	7	14
Flood	2	2	4
Seismic Activity	0	0	0
Erosion	0	2	2
Leachate	10	13	23
Emission of Toxic Gases/Mists	1	0	1
Other	4	2	6
Total	32	32	64

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-6

USEPA REGION X
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF EVENTS CAUSING CONTAMINATION INCIDENTS BY FACILITY TYPE

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Landfill	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	1	0	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	6	6	0	12
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	1	0	0	1
Open Dump	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	1	0	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	2	0	0	2
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	1	0	0	1
Surface Impoundments	Fire/Explosion	0	0	0	0
	Spills	0	1	0	1
	Leaks	0	4	0	4
	Flood	0	2	0	2
	Seismic Activity	0	0	0	0
	Erosion	0	1	0	1
	Leachate	2	4	0	6
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	1	0	0	1

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.10-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Incinerator(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				
Injection Well	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	1	0	1
Land Treatment	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	0	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Transportation Spill Site(2)	Fire/Explosion				
	Spills				
	Leaks				
	Flood				
	Seismic Activity				
	Erosion				
	Leachate				
	Emission of Toxic Gases/Mists				
	Other				

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.10-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Storage Treatment Containers	Fire/Explosion	1	0	0	1
	Spills	3	6	1	10
	Leaks	6	4	1	11
	Flood	1	0	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	1	0	0
Storage Treatment Tanks	Fire/Explosion	0	0	0	0
	Spills	1	1	0	2
	Leaks	0	3	0	3
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Storage Treatment Piles	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	1	0	1
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0
Boilers Using Waste as Fuel	Fire/Explosion	0	0	0	0
	Spills	0	0	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	0	0	0	0
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	1	1

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(1) Smpled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-6 (cont'd)(1)

Facility Type	Event	Documented	Suspected	Insufficient Information Available in File	Total
Recycling Reclamation	Fire/Explosion	1	0	0	1
	Spills	1	2	0	3
	Leaks	2	2	0	4
	Flood	1	0	0	1
	Seismic Activity	0	0	0	0
	Erosion	0	1	0	1
	Leachate	0	1	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	1	0	1
Midnight Dump	Fire/Explosion	0	0	0	0
	Spills	0	1	0	0
	Leaks	0	0	0	0
	Flood	0	0	0	0
	Seismic Activity	0	0	0	0
	Erosion	0	0	0	0
	Leachate	1	0	0	1
	Emission of Toxic Gases/Mists	0	0	0	0
	Other	0	0	0	0

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-7 summarizes the total number of times that a chemical in a given category was positively identified by sampling and analytical techniques as occurring as contaminants in the various media.

Eight of these chemical categories were identified at least once. This tabulation indicates that approximately 70 percent of the chemical categories were identified as either metals (28 percent), VHOs (22 percent) or acid compounds (20 percent). Table B.10-8 lists the most commonly occurring chemicals found in each of these categories, and the range of concentrations observed in the affected media.

B.10.7 Damage Incidents. The following six affected areas were evaluated for site related damage on the DISF.

. Drinking Water
. Food Chain
. Flora
. Fauna
. Human Health
. Property Damage

In the remainder of this section damage will be interpreted to mean both documented and suspected incidents/events unless otherwise noted.

Damage was identified for at least 15 sites, or 41 percent, of the sites evaluated. As noted in Section B.10.4 higher percentages of the sites indicated contamination (95 percent). Damage was indicated in approximately 42 percent of the contaminated sites evaluated. Of the 28 affected areas indicating damage, only 10 (36 percent) could be documented using the evaluation criteria.

Sites indicating the absence of damage, and/or files not containing sufficient information to determine damage, were also identified. A tabulation of sites identified with damage for at least one of the above categories is outlined in Table B.10-9. Of note, are the 7 sites (19 percent) identified as having damage to two or more affected areas. Of the 20 sites indicating soil contamination 5 sites also indicated in damage to drinking water. Also, of the 26 sites indicating soil and/or surface water contamination, 4 sites also indicated damage to flora, fauna or the food chain.

Table B.10-10 indicates that of the 37 sites evaluated, 9 sites (24 percent) indicated high environmental damage, 6 sites (16 percent) indicated medium environmental damage and 7 sites (19 percent) indicated low environmental damage. The remaining 15 site files indicated no apparent damage (11 percent) or did not have enough information available (30 percent) to make an evaluation. Of note, are the files associated with the 13 sites (35 percent) which suggested that the actual damage may be higher than the response described in the DISF, but the file contained insufficient analytical data available to support a higher damage rating.

The analysis also indicated that out of the 37 sites evaluated, 1 site indicated high human health damage, 1* site (3 percent) indicated medium human health damage and no sites indicated low human health damage. The remaining 35 sites indicated no apparent damage (i.e. there was no data available on public health damages) (57 percent) or while there was some data, there was not enough information available to make an evaluation (37

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*Incident not associated with the waste management facility at the site.

Table B.10-7

USEPA REGION X
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF CHEMICALS DOCUMENTED IN CONTAMINATION INCIDENTS

Chemical Category	Total Positive Identifications	Percent of Total
Volatile Halogenated Organics (VHOs)	11	22
Volatile Non-halogenated Organics (VNHOs)	2	4
Base Neutral Extractables (BNEs)	2	4
Pesticides	2	4
PCBs	4	8
Metals	12	28
Oil	0	0
Ammonia/Ammonia Compounds	0	0
Inorganics	4	8
Cyanide	1	2
Acids	0	0
Acid Compounds	10	20
Alkalies	0	0
Alcohols	0	0
Aldehydes	0	0
Ketones	0	0
Radioactive	0	0
Asbestos	0	0
Others	0	0
Total	48	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-8

USEPA REGION X
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

CONCENTRATION OF SELECTED CONTAMINANTS IDENTIFIED BY MEDIA

Most Frequently Observed Chemical Category	Contaminant	Contaminant Concentration Range Groundwater (mg/l)	Surface Water (mg/l)	Soil (mg/kg)	Air (mg/l)
VHOs	1,1,1 trichloroethane	2.09-10.0	ND	ND	ND
	trichloroethylene	0.0-315.0	ND	ND	ND
	dichloromethane	0.0-0.7	0.425	70	ND
Acid Compounds	phenols	0.0001-2.3	ND	trace-2.5	ND
Metals	lead	0.006-810	ND	ND	ND
	manganese	0.012-1.1	ND	ND	ND
	chromium	0.004-12.4	0.001-0.215	ND	ND

NOTES:

ND = no data available

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-9

USEPA REGION X
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF SITES DAMAGED

Category	Description	Total Number of Sites (Described by Category)	Percent of Total
1	Sites indicating documented damage (to at least one affected area)	6	16
2	Sites indicating suspected damage (to at least one affected area) and not identified by Category 1 above	9	24
3	Sites indicating documented or suspected absence of damage and not identified by Categories 1 and 2 above	14	38
4	Sites for which there was an absence of sufficient information in the file to make a determination of damage and not identified by Categories 1,2 and 3 above	8	22
	TOTAL SITES	37	100

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-10

USEPA REGION X
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES[(1)]

TABULATION OF NUMBER & SEVERITY OF DAMAGE INCIDENTS

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	4	5	5	17	6	37
Food Chain	1	1	0	29	6	37
Flora	0	3	0	28	6	37
Fauna	1	3	0	26	6	37
Human Health	1	5	1	24	6	37
Property Damage	3	1	0	23	10	37

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	9	6	7	11	4	37
Human Health	1	1	0	14	21	37

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(1) Sampled sites ere not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

percent). Of note, are the files associated with 19 sites (51 percent) which suggested that the actual human health damage may be higher than the severity response described in the DISF, but the file contained insufficient analytical data to support a higher damage rating.

B.10.7.1 Tabulation of Number, Type and Severity of Damage Incidents. Table B.10-10 summarizes the total number of DISF responses indicating damage to the above affected areas. Site files not containing sufficient information to determine damage were also recorded and noted under the appropriate heading in Table B.10-10.

Table B.10-10 indicates that 40 percent of the documented damage incidents occurred to drinking water, with the remaining incidents occurring to property (30 percent), human health (10 percent), fauna (10 percent) and food-chain (10 percent).

B.10.7.2 Tabulation of Number and Severity of Damage Incidents by Facility Type. Table B.10-11 summarizes the DISF responses indicating damage to each affected area by associated facility type. This analysis indicates that approximately 71 percent of the damage incidents were associated with storage facilities (29 percent), landfills (23 percent) or "other" facilities (19 percent). The remaining 29 percent of the damage incidents were associated with open dumps, land treatment, recycling/reclamation, and boilers using waste as fuel.

Table B.10-11 also indicates that the incidents involving damage to drinking water involved equally landfills, containers and tanks and land treatment.

Table B.10-11 also identifies the severity of damage to environment and/or human health. Landfills resulted in 56 percent of the cases involving high or medium environmental damage.

B.10.8 Status of Response. Table B.10-12 summarizes the status of each site evaluated from the standpoint of enforcement, investigative and remedial activites. This table indicates that only 14 percent of the files evaluated indicated that the sites identified were involved in either past or present legal or enforcement actions. However, 18 (49 percent) site files indicated that additional environmental investigations were in progress or completed. Four (11 percent) sites were reported to be involved with past or present remedial activities.

Table B.10-12 also compares the damage incident type with the remedial activities and related costs for sites having cost data available. These activities included excavation of contaminated soils, spill cleanup, and wastewater treatment. Costs of remedial actions at one site were estimated to be $160,000-$2,500,000. Costs are not available for other sites remedial actions.

Table B.10-11

USEPA REGION X
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

TABULATION OF NUMBER & SEVERITY DAMAGE INCIDENTS BY FACILITY TYPE

Landfill

	Damage		No Damage		Insufficient Information Available in File	
Affected Area	Documented	Suspected	Documented	Suspected		Total
Drinking Water	1	3	2	8	1	15
Food Chain	0	1	0	14	0	15
Flora	0	1	0	14	0	15
Fauna	0	1	0	14	0	15
Human Health	0	0	1	12	2	15
Property Damage	0	0	0	11	4	15

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	4	5	1	2	3	15
Human Health	0	0	0	5	10	15

Open Dump

	Damage		No Damage		Insufficient Information Available in File	
Affected Area	Documented	Suspected	Documented	Suspected		Total
Drinking Water	0	0	0	2	0	2
Food Chain	0	1	0	1	0	2
Flora	0	1	0	1	0	2
Fauna	0	1	0	0	1	2
Human Health	0	0	0	2	0	2
Property Damage	0	0	0	1	1	2

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	1	0	0	2
Human Health	0	0	0	1	1	2

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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Table B.10-11 (cont'd)[1]

Surface Impoundments

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	1	3	3	7
Food Chain	0	0	0	5	2	7
Flora	0	0	0	5	2	7
Fauna	0	0	0	5	2	7
Human Health	0	0	0	5	2	7
Property Damage	0	0	0	4	3	7

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	1	1	3	1	7
Human Health	0	0	0	2	5	7

Incinerator[2]

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.10-11 (cont'd)(1)

Injection Well

Affected Area	Damage Documented	 Suspected	No Damage Documented	 Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	1	0	1
Food Chain	0	0	0	1	0	1
Flora	0	0	0	1	0	1
Fauna	0	0	0	1	0	1
Human Health	0	0	0	1	0	1
Property Damage	0	0	0	1	0	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	1	0	1
Human Health	0	0	0	0	1	1

Land Treatment

Affected Area	Damage Documented	 Suspected	No Damage Documented	 Suspected	Insufficient Information Available in File	Total
Drinking Water	1	0	0	0	0	1
Food Chain	0	0	0	1	0	1
Flora	0	0	0	1	0	1
Fauna	0	0	0	1	0	1
Human Health	0	1	0	0	0	1
Property Damage	1	0	0	0	0	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	0	0	0	1
Human Health	0	0	0	1	0	1

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-11 (cont'd)(1)

Transportation Spill Site(2)

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water						
Food Chain						
Flora						
Fauna						
Human Health						
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental						
Human Health						

Storage Treatment Containers

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	1	1	1	7	5	15
Food Chain	0	0	0	9	6	15
Flora	0	2	0	7	6	15
Fauna	0	2	0	8	5	15
Human Health	1	1	0	9	4	15
Property Damage						

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	3	8	3	15
Human Health	0	0	0	8	7	15

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-11 (cont'd)(1)

Storage Treatment Tanks

Affected Area	Damage: Documented	Damage: Suspected	No Damage: Documented	No Damage: Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	1	4	4	9
Food Chain	0	0	0	5	4	9
Flora	0	0	0	5	4	9
Fauna	0	0	0	5	4	9
Human Health	0	0	0	5	4	9
Property Damage	0	1	0	5	3	9

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	1	5	3	9
Human Health	0	0	0	4	5	9

Storage Treatment Piles

Affected Area	Damage: Documented	Damage: Suspected	No Damage: Documented	No Damage: Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	2	1	3
Food Chain	0	0	0	2	1	3
Flora	0	0	0	2	1	3
Fauna	0	0	0	2	1	3
Human Health	0	0	0	2	1	3
Property Damage	0	0	0	2	1	3

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	0	2	1	3
Human Health	0	0	0	1	2	3

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

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Table B.10-11 (cont'd)(1)

Boilers Using Waste as Fuel

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	0	0	1	1
Food Chain	0	0	0	0	1	1
Flora	0	0	0	0	1	1
Fauna	0	0	0	0	1	1
Human Health	0	0	0	0	1	1
Property Damage	0	0	0	0	1	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	1	0	1	0	0	1
Human Health	0	0	0	1	0	1

Recycling/Reclamation

	Damage		No Damage			
Affected Area	Documented	Suspected	Documented	Suspected	Insufficient Information Available in File	Total
Drinking Water	0	0	1	0	3	4
Food Chain	0	0	0	1	3	4
Flora	0	0	0	1	3	4
Fauna	0	0	0	1	3	4
Human Health	0	1	0	0	3	4
Property Damage	0	1	0	1	2	4

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	1	3	0	4
Human Health	0	0	0	4	0	4

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

(2) Facility type not identified in files evaluated.

Table B.10-11 (cont'd)(1)

Midnight Dump

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	0	0	0	1	0	1
Food Chain	0	0	0	1	0	1
Flora	0	0	0	1	0	1
Fauna	0	0	0	0	1	1
Human Health	0	0	0	1	0	1
Property Damage	0	0	0	1	0	1

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	0	0	1	0	0	1
Human Health	0	0	0	0	1	1

Other

Affected Area	Damage		No Damage		Insufficient Information Available in File	Total
	Documented	Suspected	Documented	Suspected		
Drinking Water	1	1	0	1	0	3
Food Chain	1	0	0	1	1	3
Flora	0	1	0	1	1	3
Fauna	1	0	0	1	1	3
Human Health	0	1	0	1	1	3
Property	0	0	0	1	2	3

Severity of Damage

Affected Area	High	Medium	Low	Insufficient Information Available in File	No Apparent Damage	Total Number of Responses
Environmental	2	0	0	1	0	3
Human Health	0	0	0	2	1	3

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(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

Table B.10-12

USEPA REGION X
HAZARDOUS WASTE SITES
DISF SUMMARY OF EVALUATED SITES(1)

STATUS OF RESPONSE

Total Number of Sites...

...evaluated	...with legal/enforcement action underway/completed	...with investigative actions underway/completed	...with remedial actions underway/completed
37	5	18	4

DESCRIPTION OF REMEDIAL ACTIVITY

Damage Incident		Facility type	Location	Remedial Activity	Costs ($)
1.	Fires, Spills, leaks.	RR	Seattle, WA	Spill cleanup, separate incompatible wastes, drum labeling, and inventory reduction	160,000-2,500,000

(1) Sampled sites were not randomly selected. Site selection criteria and the implications of these criteria are discussed in detail in Section 3.1.1 and 3.2.1.

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418x
all